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# NURSING STRUCTURE VARIABLES

# AND UNIT BASED CLIENT OUTCOMES

by

Sherry René Rawls-Bryce

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A Thesis Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

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This thesis has been approved on the date shown below:

_Joyce A. Verran_     _April 30, 1996_
Joyce A. Verran          Date
Professor of Nursing

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ABSTRACT

The purpose of this exploratory, descriptive study was to examine the relationships between nursing Structure of Care indicators and Client Outcome indicators in the acute care setting. An additional purpose was to determine whether the nursing Process of Care significantly mediated the effects that nursing Structure has on Outcomes.

This study was a secondary analysis of data from a research project on the Differentiated Group Professional Practice Model (DGPP). Correlational statistics were used to examine the relationships between variables. Multiple regressions were used to further examine the effects of independent variables on dependent variables and make determinations regarding a possible mediating variable.

Nursing Structure variables were both positively and negatively related to Client Outcomes. The Process of Care was significantly related to Structure variables, yet did not mediate the effects that the variables have on Client Outcomes. Models are presented showing the relationships between Structure, Process, and Outcome variables.

CHAPTER 1

INTRODUCTION

A multitude of changes are occurring in today's health care environment. Many

of the changes in our health care system are necessary due to the rapid and steady increase

in costs of providing health care for the people of our nation. In addition, there is concern

about the great number of Americans who are underinsured or uninsured. Consumers of

health care are recognizing the problems in our current system and are seriously

questioning the cost and quality of care they are receiving. According to public opinion

polls on Americans' concerns, health reform is typically ranked near the top (Sharp,

1995). An overall dissatisfaction with our current system has led the public, businesses

and insurance companies to become more actively involved in our nation's health care

delivery system (Blancett & Flarey, 1995). A plan for National Health Care Reform was

proposed by President Clinton in 1992 with hopes of providing universal access to quality

care within a cost contained environment. The president's plan for reform has dissolved

with the government's failure to reach a consensus after much controversy and debate

(Clarke, 1996). Although federal legislation to improve health care still has not occurred,

many states are enacting their own plans for reform (Buerhaus, 1994; Lutz, 1995). State

plans for reform are trickling down to the local level where health care institutions are

becoming involved.

Efforts at health care reform now dominate the agendas of most American

hospitals. Changing paradigms of health care are being addressed by many health-related

disciplines. Health care consultants, executives, managers, and educators everywhere are searching for the ideal direction for change. Frequently the focus is on the entire structure of the organization. The contemporary critics of business management and organizational design are in agreement that the traditional bureaucratic structures of health care institutions will not survive in the present competitive health care environment. Since the current health care organizational structures often lead to inefficiency and waste, the need to make organizational improvements is imminent (Blancett & Flarey, 1995).

## Hospital Reorganization Strategies

Most of the current strategies for improvement in health care delivery are selected to meet the primary objectives of national health care reform: improving access to care, decreasing the costs of health care, and improving the quality of care. These key objectives are being used as a basic framework for organizational strategy development. How is the goal of improved quality care approached concurrently with the goal of cost reduction? In the traditional sense these goals appear as contradictory concepts. We are accustomed to paying the price for quality enhancements. With a new challenge at hand, many promising innovations and creative ideas are appearing in the literature. Following the direction of management theorists, significant transformations in the form of workforce restructuring and redesign are being suggested (Blancett & Flarey, 1995). A number of these ideas have made the journey from theory to practice. Hospitals all over America, are adopting and implementing plans for organizational redesign with a focus on patient care services.

Nursing's Response to Restructuring

With nursing personnel accounting for a significant percentage of the acute care workforce (Aiken, 1990), hospital reorganization efforts have a significant impact on the delivery of nursing care. Many strategic changes in America's hospitals are primarily intended to enhance cost savings. There is much controversy regarding the aftereffects that the current changes have on nursing as a profession. Some groups fear for the perceived value and reputation of nursing while others see the opportunity for progression. Leininger (1994) is concerned about health care reform and conceives that noteworthy advancements in the discipline of nursing may be lost due to trends such as an overemphasis on costs. Turner (1995) believes that the time has come for the nursing profession to accept the changes at hand and take this opportunity to move ahead in the new health care culture.

Nursing in Support of Redesign

There are reports of implemented redesign models that show how quality care is maintained or enhanced while reducing costs. Peruzzi, Ringer, and Tassey (1995) describe their success in implementing an innovative redesign plan in a 212-bed community hospital. Their model involved changes in skill mix that resulted in cost savings, along with improved or unchanged quality indicators and satisfaction. Smeltzer, Formella, and Beebe (1995) illustrate the process and results of a Florida hospital's reengineering experience. Part of their plan included a reduction in the skill-mix of registered nurses from 87 percent to 62 percent. Improvements in quality care, nurse and patient satisfaction, and a 15 percent budget reduction were realized after only 18 months

of implementation. Anderson and Hughes (1993) describe how a chronic care and rehabilitation hospital in Canada successfully implemented a new nursing care delivery system that resulted in improved accountability of client outcomes and continuity of care. They effectively used a combination of different staff qualification levels while achieving their goals of quality care under persistent fiscal and staffing pressures.

Nursing in Opposition of Redesign

While some nurses and administrators are professing the positive effects of change, others are presenting a contrasting picture. The voice of opposition is louder. There is a fervent belief among many nurses that in an attempt to control costs, attention to the coexisting issue of quality care is often missing. A host of strong opinions and beliefs regarding an imbalance of emphasis on cost and quality care are evident in the media, literature, and political arenas.

Many RNs are speaking out about redesigned staffing patterns. A 1994 survey of 52 hospitals, conducted by a consulting firm in hospital restructuring, found that 87 percent cut Registered Nurse (RN) positions during redesign ventures. Often these positions were filled with unlicensed workers (Lumsdon, 1995). A 1994 issue of The American Journal of Nursing (AJN) reported that administrators in a hospital in Chicago have plans to eliminate over 150 RN positions and move Licensed Practical Nurses (LPNs) and unlicensed workers into those slots. Both nurses and doctors at a Massachusetts hospital stated dissatisfaction with new models of care that substituted RNs with additional unlicensed personnel. Nurses at a Boston hospital used the media to successfully resist restructuring that introduced expanded job descriptions for new

"patient care associates" (AJN, 1994). An investigation was launched in March of 1995 by Indiana's Attorney General as a result of allegations that unlicensed workers were doing patient care functions that only doctors or nurses were qualified to perform. As a result, the public was urged to question who performs procedures and to report misuse of unlicensed workers by calling a hot-line (AJN, 1995). There is much concern about the creation of new nursing practice models that value cost reduction more than professional nursing judgment (Edwards & Horn, 1995).

Many nurses are concerned that restructuring, which includes a reduction in numbers of RNs to save dollars, is ultimately resulting in substandard patient care (Burda, 1994; Service Employees International Union, 1993). Nurses are feeling the frustration of having more work to do with less time to do it. They are concerned that they are not meeting the patient's needs (Lumsdon, 1995). Along with the American Nurses Association (ANA), a number of specialty professional nursing organizations are enacting nursing practice standards that establish recommended nurse patient ratios in hopes of influencing quality standards (Lamkin, & Sleven, 1991). There is hope that these standards will effectively limit change in nurse staffing patterns designed to primarily accomplish monetary goals. Nurses everywhere are beginning to question the effectiveness of the many changes in health care delivery. In August of 1995, thousands of nurses and supporters marched across the Golden Gate Bridge in San Francisco to denounce restructuring efforts that they feel may compromise patient care (Moore, 1995).

Concerns also arise with the changes for admission of patients to acute care facilities. The fewer patients who are admitted are often of higher acuity levels and

consequently require more resources (Shortell et al., 1994). This is an important

consideration with trends that include reductions in RN staff. How will nurse staffing

patterns need to be changed to accommodate the increase in overall patient acuity?

The Need to Resolve the Conflict

All over America hospital administrators and redesign consulting firms are

eagerly proposing their intentions for cost savings along with quality care. There is

obvious conflict among nurses who believe that health care redesign efforts may not

result in outcomes that meet objectives related to both cost and quality. Lumsdon (1995)

states that "Nurses offer plenty of anecdotes about near-misses caused by staffing

cutbacks and the use of unlicensed aides. But there's no direct evidence yet that the

quality of hospital care is suffering at the hands of redesign" (p. 34). A critical evaluation

of the complex impact of organizational restructuring in hospitals is necessary. Sound

research focused on nursing and patient outcomes will help to resolve the conflict at

hand.

Nursing and Outcomes Research

Nurses are concerned about quality patient care. Cummings (1992) asserts that

the care provided by nurses is a substantial component of patient care and can

significantly influence patient outcomes. Research linking RN practice with quality

outcomes is necessary to substantiate this belief. The National Center for Nursing

Research sponsored an invitational conference in the fall of 1991 on the effectiveness of

nursing practice on patient outcomes (DHHS, 1992). Nurse researchers presented

valuable findings and insight into outcomes research. In the fall of 1994, the American Academy of Nursing sponsored an invitational conference of experts to discuss research related to organizational variables, staff variables, and patient outcomes (Verran, 1996). Many other nursing sessions, conferences and committees have been convened to share and discuss advances in outcomes research. Despite the surge of interest and concern in this area of research, the field of outcomes measurement is in its infancy (ANA, 1995).

The ability to index quality care is also the concern of American consumers, employers, and legislators. A number of "report cards" designed to measure quality of hospitals and other health care organizations are currently in use. As a response to the concerns in the nursing community regarding the quality and safety of patient care in hospitals, the ANA began to focus on the objective measurement of nurses' contribution to inpatient hospital care. The ANA commissioned Lewin-VHI, Inc. to develop a Nursing Report Card for Acute Care Settings (ANA, 1995), a standardized method to measure nurse-specific quality care.

The main objective in developing a Nursing Report Card for Acute Care Settings was to provide a reliable framework for assessing linkages between nursing care and patient outcomes. Nurse-specific measures of quality care were identified, evaluated and translated into three categories of Nursing Quality Indicators. These indicators were derived from a strategy that included extensive examination of previous research findings, consulting with an ANA Advisory Committee, consulting with other experts in nursing quality and outcomes research, and conducting a series of ten focus groups at the 1994 ANA convention. The focus groups were composed of registered nurses employed

in acute care inpatient settings, nurse administrators, nurse educators, and key nurse leaders in the field (ANA, 1995). The ANA Advisory Committee narrowed and refined the summary of findings to the final list of 21 indicators. The ANA publication, Nursing Care Report Card for Acute Care, provides a detailed explanation of the methods used to identify and refine the nursing quality indicators.

The report card contains a series of Acute Care Nursing Quality Indicators that is divided into three categories: Patient Outcome indicators, Process of Care indicators, and Structure of Care indicators. The Structure of Care indicators relate to measures of nurse staffing patterns and how they affect quality and quantity of care. The Process of Care indicators focus on certain patterns of nursing care delivered such as assessments and patient education. Patient Outcome indicators focus on the patient situations, conditions and perceptions that are affected by interactions with the nursing staff (ANA, 1995).

Although the ANA Board of Directors asserts that the 21 Nursing Quality Indicators have a conceptual link to quality of care, there is very little empirical data to support this claim. We must begin to build upon the current knowledge base by investigating the ANA indicators as measures of the quality of nursing and their relationship and influence on the current quality of patient care. With continued research in this area, we can begin to objectively address the controversy over cost versus quality and answer questions raised by the turbulent issues surrounding hospital reorganization. This study represents a beginning step in this process by using an available data set containing information on the Structure of Care, Process of Care and Patient Outcomes. In this study Patient Outcomes are referred to as Client Outcomes. Since the data were

not originally collected for the purposes of this study, there are limitations to the findings. However, such an investigation will provide beginning support for further research.

## Purpose of the Study

The purposes of this exploratory, descriptive study were to: (a) examine the relationships between nursing Structure variables of RN Staffing Patterns and Client Outcomes of Adverse Incidents in the acute care setting, (b) examine the relationships between nursing Structure variables of RN Qualifications and Client Outcomes of Adverse Incidents in the acute care setting, and (c) to determine whether the Process of Care significantly mediates the effects that nursing Structure has on Client Outcomes. An additional purpose was to explore the changes in relationships between variables after the acuity level of patients is controlled. The Complexity of Nursing Care variable was added to this study as a control for the patient acuity level.

The numerous changes in the composition and structure of the nursing workforce have generated much concern regarding the impact on Client Outcomes. This study is a secondary analysis of selected data from the Differentiated Group Professional Practice (DGPP) in Nursing project (Verran, Gerber, & Milton, 1996). The results of this exploratory study may be used as a beginning inference to design further studies. By building our knowledge base, we come closer to understanding if patients are indeed receiving quality care in the midst of the many nursing workforce modifications.

Research Questions

A total of seventeen research questions were asked in this study. There were eight research questions that related to the first purpose of this study, eight research questions that related to the second purpose of this study, and one research question that related to the third purpose of this study. The three groups of questions are presented below.

Structure of Care -- RN Staffing Patterns

In response to the first purpose of this study, there were eight research questions posed to determine if significant relationships existed between the nursing Structure variables of RN Staffing Patterns, and Client Outcome variables:

1. What is the relationship between RN to Patient Ratio and IV Fluid Error Rate?

2. What is the relationship between RN to Patient Ratio and Skin Injury Rate?

3. What is the relationship between RN to Patient Ratio and Patient Fall Rate?

4. What is the relationship between RN to Patient Ratio and Nosocomial Infection Rate?

5. What is the relationship between RN to Total Nursing Staff Ratio and IV Fluid Error Rate?

6. What is the relationship between RN to Total Nursing Staff Ratio and Skin Injury Rate?

7. What is the relationship between RN to Total Nursing Staff Ratio and Patient Fall Rate?

8. What is the relationship between RN to Total Nursing Staff Ratio and Nosocomial Infection Rate?

Structure of Care -- RN Staff Qualifications

In response to the second purpose of this study, there were eight research questions posed to determine if significant relationships existed between the nursing Structure variables of RN Qualifications and Client Outcome variables:

9. What is the relationship between RN Staff Experience and IV Fluid Error Rate?

10. What is the relationship between RN Staff Experience and Skin Injury Rate?

11. What is the relationship between RN Staff Experience and Patient Fall Rate?

12. What is the relationship between RN Staff Experience and Nosocomial Infection Rate?

13. What is the relationship between RN Staff Education and IV Fluid Error Rate?

14. What is the relationship between RN Staff Education and Skin Injury Rate?

15. What is the relationship between RN Staff Education and Patient Fall Rate?

16. What is the relationship between RN Staff Education and Nosocomial Infection Rate?

Process of Care – Nursing Process Documentation

In response to the third purpose of this study, the final research question relating to the Process of Care is presented:

17. Does Nursing Process Documentation significantly mediate the effects that nursing Structure of Care has on Client Outcomes?

Definition of Terms

The ANA (1995) nursing care report card was used as a resource for developing operational definitions of Structure of Care, Process of Care, and Client Outcome

indicators for this study. In addition, variables were defined by their availability in the data set to be used for this secondary analysis. The following Structure of Care indicators were defined as:

1. RN to Total Nursing Staff Ratio: The number of registered nurses per number of the total nursing staff. The total nursing staff included RNs, LPNs and unlicensed workers.

2. RN to Patient Ratio: The number of registered nurses per patient day.

3. RN Staff Experience: A measure of RN staff qualifications; determined by the number of years licensed as an RN.

4. RN Staff Education: A measure of RN staff qualifications; determined by the distribution of educational preparation reported by RN staff.

The following Client Outcome indicators were defined as follows:

1. IV Fluid Error Rate: The rate at which reported errors in the administration of IV fluids occur within a given nursing unit.

2. Skin Injury Rate: The rate at which patients incur physical injuries to the skin during the course of their hospital stay, including but not limited to pressure sores and burns.

3. Patient Fall Rate: The rate at which patients are reported to fall during the course of their hospital stay.

4. Nosocomial Infection Rate: The rate at which patients experience infections originating in the hospital.

The Process of Care indicator, Nursing Process Documentation, was defined as: Documented evidence that nurses working in an acute care setting were performing specific components of the nursing process. The nursing process encompasses assessment and implementation of patient care requirements including development of a nursing care plan, nursing diagnoses, therapeutic objectives, and care given.

## Summary

Dramatic changes are occurring in the health care environment in the United States. Based on the primary objectives of national health care reform, health care institutions are responding with strategies for change. Organizational changes are emerging as new models of patient care delivery under the concepts of restructuring or redesign. Hospital administrators are implementing a number of creative redesign strategies to reduce costs while hopefully maintaining or improving care.

These restructuring efforts are severely affecting the nurses who are currently employed in the acute care workforce. Professional RN positions are often eliminated and replaced with LPNs or unlicensed workers to save dollars. Nurses are concerned that these new models of patient care are resulting in adverse changes in the quality of care. Professional nurses provide a substantial component of patient care that conceivably can significantly influence outcomes of care. The question of how the structure and process of nursing care are related to patient outcomes remained unanswered in the literature. Nurse researchers are beginning to investigate the linkages between the structure and process of nursing care and patient outcomes.

The purpose of this secondary analysis was to examine the relationships between nursing Structure of Care, Process of Care, and Client Outcomes in the acute care setting. The ANA Report Card (1995) on nursing quality indicators was used as a framework to select nursing variables with a theoretical or conceptual linkage to patient outcomes. This study was a secondary analysis of data from the DGPP in Nursing project conducted in Arizona hospitals from 1989-1992. Research questions were presented and the concepts to be investigated were defined in this chapter.

## CHAPTER 2

## LITERATURE REVIEW/CONCEPTUAL FRAMEWORK

Outcomes Research

In agreement with the objectives of the ANA, a trend in outcomes research has generated a growing interest in nursing quality indicators in the domains of research and academia. Moritz (1995) effectively summarizes the transitions in outcomes research focus throughout the years. As Moritz states, nursing research on quality care is not a new phenomenon, as it has been around since Florence Nightingale's nursing practice. Despite the obvious contribution of nursing to health care, traditionally published outcomes research has been limited to the effects of physician intervention (Kelly et al., 1994). Only recently has outcomes research related to nursing practice had an emphasis in the literature.

The National Center for Nursing Research (NCNR) sponsored an invitational conference in the fall of 1991 on patient outcomes research. Nursing scientists presented their findings in a number of areas including nursing interventions, patient and contextual factors, methods and measurement, and data sources as they relate to patient outcomes. Recommendations for future directions in outcomes research were formulated by the conference participants. Those recommendations included a goal to increase participation in research that examines contextual influences, such as organizational change, on nursing practice (DHHS, 1992). In keeping with this recommendation, much of the current

literature focuses on alternative models of nursing practice and their effect on patient outcomes.

In the fall of 1994, a special conference was convened by the American Academy of Nursing to assemble researchers who were involved with projects covering relationships between organizational variables and quality of care. Of the six studies presented in the conference, three were related to the implementation of professional practice models (Verran, 1996). Although these studies were primarily initiated in response to the contemporary nursing shortage, the extensive data base was considered as a potential source for additional analysis of variables related to the quality of nursing care. The ANA (1995) attributes much of the inadequacy in outcomes research to the difficulties with data collection and accessibility.

Differentiated Group Professional Practice (DGPP) Model

One of the research studies presented at the American Academy of Nursing Conference was the demonstration and research project in progress at The University of Arizona. The researchers were implementing a professional practice model entitled the Differentiated Group Professional Practice (DGPP) Model in three hospitals on a total of nine nursing units. The data were compared to three other hospitals (ten nursing units) where the DGPP was not implemented. The project objectives were to test the effectiveness of the professional practice model on professional practice, nurse satisfaction, nurse resources, quality outcomes, and fiscal outcomes (Verran, Gerber, & Milton, 1996).

Many of the concepts and indicators measured during the DGPP project were consistent with the ANAs 1995 recommendations for nursing quality indicators. The patient outcomes measured in the DGPP are listed by the ANA as indicators of quality and are frequently found in the literature as measures of quality care. The DGPP project data collected on the RN staff focused primarily on variables related to staff nurse retention, including aspects of professional practice, nurse satisfaction, nurse resource measures, and fiscal outcomes related to nurse staffing. The abundance of data collected from the RNs also encompassed a variety of demographic information including education level and experience level. In addition, management data on RN hours worked per unit, patient days per unit, and total nursing staff hours per patient day, were also available. These nursing variables relating to experience, education and staffing pattern are also recommended as appropriate Structure of Care indicators by the ANA (1995). Jennings (1991) recognized that variations within care provider group, such as educational level and experience level of nurses are important to consider when examining patient outcomes. Moritz (1991) also suggests the consideration of staffing patterns as an independent variable in outcomes research. A number of ANA recommended variables relating to the process of nursing care were also collected for the DGPP project.

Recognition of the DGPP project as a rich source of data for patient outcomes research was an impetus for investigation of the questions presented. Using the DGPP data base and the ANA recommendations for Structure of Care, Process of Care, and Patient-Focused Outcome Indicators, the independent and dependent variables were selected for this research.

Literature Review

Much of the current literature on outcomes research focuses on what variables to consider as measures of quality nursing care and how to reliably measure them (Brooten & Naylor, 1995). In addition, problems with attributing the inputs and interventions of a single discipline to patient outcomes are also posed in the literature (Bond & Thomas, 1991; Holzemer, 1990; Kelly et al., 1994; Moritz, 1995; Prescott, 1993). The issues and complexities of balancing cost-effectiveness with quality care are also frequently addressed. Many authors have written insightful narratives declaring support of the importance of measuring nursing factors and patient outcomes. What about current research on relationships between the independent nursing variables and the dependent patient outcome variables identified for this research as valuable in assessing quality of care? Although bits and pieces were found, generally there was a gap in the current research knowledge base exploring relationships between the identified variables. The following is a summary of available findings.

<u>Structure of Care Indicators</u>

<u>RN Staff Qualifications.</u> An RN's experience level is considered one component of an RN's qualifications to practice nursing. The studies relating to nursing experience use works by Benner (1984) as a starting point for understanding the relationship of experience to outcomes. Benner eloquently explains the concepts of clinical nursing expertise and the critical impact that nursing has on the patient. The current literature is limited in support of relationships between RN experience and patient outcomes. The following articles provided a knowledge base for further study.

A dissertation study by Goodnough-Hanneman (1990) focused on relationships and patterns between expert and nonexpert critical care nursing practice and patient outcomes. The author used the grounded theory field approach to analyze relationships. Twenty-six staff nurses and thirty-one patients were observed and interviewed to obtain data for analysis. The findings indicate that advances in nursing expertise has a positive effect on nursing practice, which in turn results in positive outcomes including prevention of patient complications, and early detection and reversal of patient complications.

A demonstration project that included the examination of relationships between RN expertise and patient outcomes was developed by the American Association of Critical-Care Nurses and was tested using a single descriptive case design (Mitchell, Armstrong, Simpson, & Lentz, 1989). The data were collected from 42 nurses, 68 physicians and 192 patient admissions in two nursing units in a Seattle hospital. The authors used comparison samples from the literature or from individual investigators to derive statistical relationships. The findings revealed a significant negative relationship between RN expertise and patient mortality. No significant relationship was found between RN expertise and patient complications.

RN Staffing Patterns. The RN to Total Nursing Staff Ratio is often referred to as the skill mix of nursing care providers. This concept can be found in the literature in relation to quality care as well as cost factors. Although cost was not listed directly by the ANA as a quality indicator, it can be indirectly accounted for in many of the outcome indicators. Glandon, Colbert, and Thomasma (1989) discussed the cost savings of using nursing care delivery models with smaller ratios of RNs. The authors pointed out that the

analysis did not account for quality of care variations. Wong, Gordon, Cassard, & Bergner (1993) also conducted a study to analyze the cost of nursing care based on a model for nursing care. They discussed the need to consider the quality of patient care in conjunction with costs before making recommendations. As in the discussion of RN experience levels, few current research studies measuring nursing staff ratios and the dependent variables of focus were available.

Aiken, Smith & Lake (1994) investigated aspects of nursing care in relation to mortality rates. They sought to discover how the characteristics and nursing structure of "magnet hospitals" (commonly accepted as hospitals that retain professional nurses and provide good nursing care) affected patient outcomes. A comparison was made between 39 "magnet" hospitals and 195 control hospitals. The finding of this quasi-experimental study design revealed that "magnet hospitals," which had a higher percentage of RNs to total nursing staff, had lower Medicare mortality rates. These findings reveal a linkage between staff mix and patient outcomes.

Brett & Tonges (1990) provide an evaluation of the implementation of a new nursing care model and the effects on quality of care. The model proposes a cost saving by the use of fewer RNs. The quality of care indicators included patient incidents and infections. Both of these variables remained stable, without significant change before, and four and five months after implementation of the new nursing model.

A quantitative study by Hartz et al. (1989) used mortality data published by the Health Care Financing Administration (HCFA) and hospital characteristics from the American Hospital Association's survey of hospitals. They consistently found a significant

relationship between high ratios of RNs per nursing staff and lower adjusted mortality rates.

The RN to Patient Ratio is also being examined as a component of RN Staffing Patterns. The literature supports the assertion that RN staffing levels in relation to patient census has an effect on different patient outcomes. The research previously described by Hartz et al. (1989) using HCFA mortality rates additionally found a significant negative relationship between RN to patient ratio and mortality rates, although the authors combined registered nurse ratio indicators in a multivariate analysis of the data. Aiken, Smith and Lake's (1994) research on mortality cited previously reveals a significant negative relationship between RN to patient ratio and mortality. It is interesting to note that Aiken et al. (1994) do not credit the high RN ratios as the explanation for the decreased mortality rates, but hospital-wide differences in nursing care organization. Prescott (1993) provides a review of literature with articles from the 1970s and 1980s that reveal significant linkages between nurse staffing adequacy and patient outcomes. Many of these older studies tend to explore this issue from the perspective of the cost of nurse staffing.

Shortell et al. (1994) tested the hypothesis that the higher the nurse to patient staffing ratio, the better the unit's performance. Included as unit performance criteria was the dependent variable, risk-adjusted mortality. The data were collected from a sample of 42 medical-surgical intensive care units (ICU) in 40 hospitals. The results did not show a significant relationship between nurse staffing and risk-adjusted mortality. The authors suggest the low variance in staffing ratios for units of study as a possible reason for this

finding. The overall average nurse to patient ratio for the study units was slightly more than one nurse for every two patients, as is expected in an ICU setting.

Taunton, Klienbeck, Stafford, Woods, and Bott (1994) conducted a study that did not directly measure RN to patient ratio, yet studied RN absenteeism as a factor in the adequacy of nursing care in relation to patient outcomes. Using a correlational design, data were collected in four large acute care hospitals to measure relationships between organizational nursing phenomena and patient outcomes. The nursing variables included RN absenteeism, unit separation, and work load. These variables were compared to patient nosocomial infections, patient falls and medication errors. A significant relationship was found between RN staff absenteeism and nosocomial infections using a design that included replication across hospitals and overtime. Whether the absence of an RN on a given day actually decreased the RN to patient ratio is not indicated. The authors suggest disrupted continuity of care and the use of less skilled nurse as a possible explanation for the findings.

Process of Care Indicator

Studies on the processes of nursing care and their effects on outcomes were emphasized in the 1970s (Moritz, 1995). Written communication systems on a nursing unit were regularly used by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) as a measure of quality patient care. Documentation of nursing care plans and other nursing activities were evaluated and scored for accuracy and completeness (Hanson, Kennedy, Dougherty, & Baumann, 1990). Currently, the use of the nursing process is still considered by nursing to be a critical element in effectively

caring for a patient (ANA, 1995), yet current research linking this process to patient outcomes is inadequate.

A component of the Process of Care is Nursing Process Documentation and is considered to be an indicator of quality (ANA, 1995). There is discursive support for the nursing process and its benefit to patient outcomes (Hanson et al., 1990; Turner, 1991; Young-Meyer, 1993). In non-empirical reports, authors such as Young-Meyer (1993) describe a number of positive outcomes in patient care with the active use of the nursing process by nurses.

A national research study, including over 14,000 Medicare patients from 297 hospitals investigated the quality of nursing surveillance activities (Rubenstein, Chang, Keeler, & Kahn, 1992). Nursing surveillance activities included documentation of nursing assessments of key signs and symptoms, a component of the nursing process. High values in nursing surveillance activities were positively correlated with a reduction in patient mortality at 30 and 180 days following admission when controlled for sickness at admission. No other patient outcomes were measured in this study.

A two-group quasi-experimental research design was used by Burdick and Stuart (1994) to look for differences in the quality of patient outcome criteria on two psychiatric inpatient units based on the nursing documentation used. Although the nursing process was not studied in relation to specific adverse incidents, the authors suggested that according to the overall findings, documentation of the nursing process had a positive impact on patient care outcomes.

<u>Gaps in Knowledge</u>

It is evident from the scant supply of published empirical knowledge relating to the four Structure of Care variables and Process of Care variable that nursing could benefit from further research in examining the relationship of the selected variables to patient outcomes. What is missing in the literature relating to the proposed study variables?

<u>RN Staff Qualifications.</u> RN Staff Qualifications include both RN Experience and RN Education levels. The education level of RNs in relation to outcomes is not directly explored in the literature although an indirect association is often implied. Although studies relating to bachelor's and master's prepared nurses are unavailable, there is evidence that Advanced Practice Nurses have an effect on outcomes. Brooten and Naylor (1995) summarize the current studies that characterize the positive influence that Clinical Nurse Specialists and Nurse Practitioners have on patient outcomes. Advanced Practice Nurses are categorized by their advanced levels of academic nursing education.

Although a few articles relating to registered nurse staff experience were mentioned, a deficit in establishing a strong relationship between RN Staff Qualifications and patient outcomes remains. Although many authors casually imply that nurse qualification has an impact on patient care, there is no current scientific evidence to support this claim in relation to basic education level. Morey-Peterson (1994) believes that nurses must possess a Bachelor of Science in Nursing (BSN) degree, or higher, to succeed in our reformed health care system. McClure (1991) describes how differentiated nurse practice models must include the clinical competence of nurses as well as their practice level (i.e., bachelor's versus diploma preparation). She points out that the use of

differentiated practice models will probably improve patient care, but agrees that it is complex and difficult to prove.

RN Staffing Patterns. Another area of outcomes research that is currently under represented is whether there is a relationship between patient outcomes and the RN Staffing Patterns. Research on both RN to Patient Ratio and the RN to Total Nursing Staff Ratio with a focus on outcomes other than, or in addition to, cost was needed. Although there were current studies in support of significant relationships between the variables of interest, at least one study conflicted with results that showed no relationships among variables relating to nursing staff ratios and patient outcomes. There was clearly a need to explore this issue further.

Process of Care. As with the Structure of Care variables, research linking the Process of Care to Client Outcomes was insufficient. Research examining the nursing process as a variable that mediates the effects of nursing structure variables was absent in the literature. More research on processes of care and their relationships to patient outcomes was also needed.

Conceptual Framework

The model used to conceptualize the relationship between the selected Structure of Care indicators, Process of Care indicators, and Client Outcomes was divided into three levels: construct, concept and operational (Figure 1). The more abstract construct level, which is the familiar "structure, process, outcome" paradigm, was first conceptualized by Donabedian in 1966. This earlier paradigm was created to organize information that
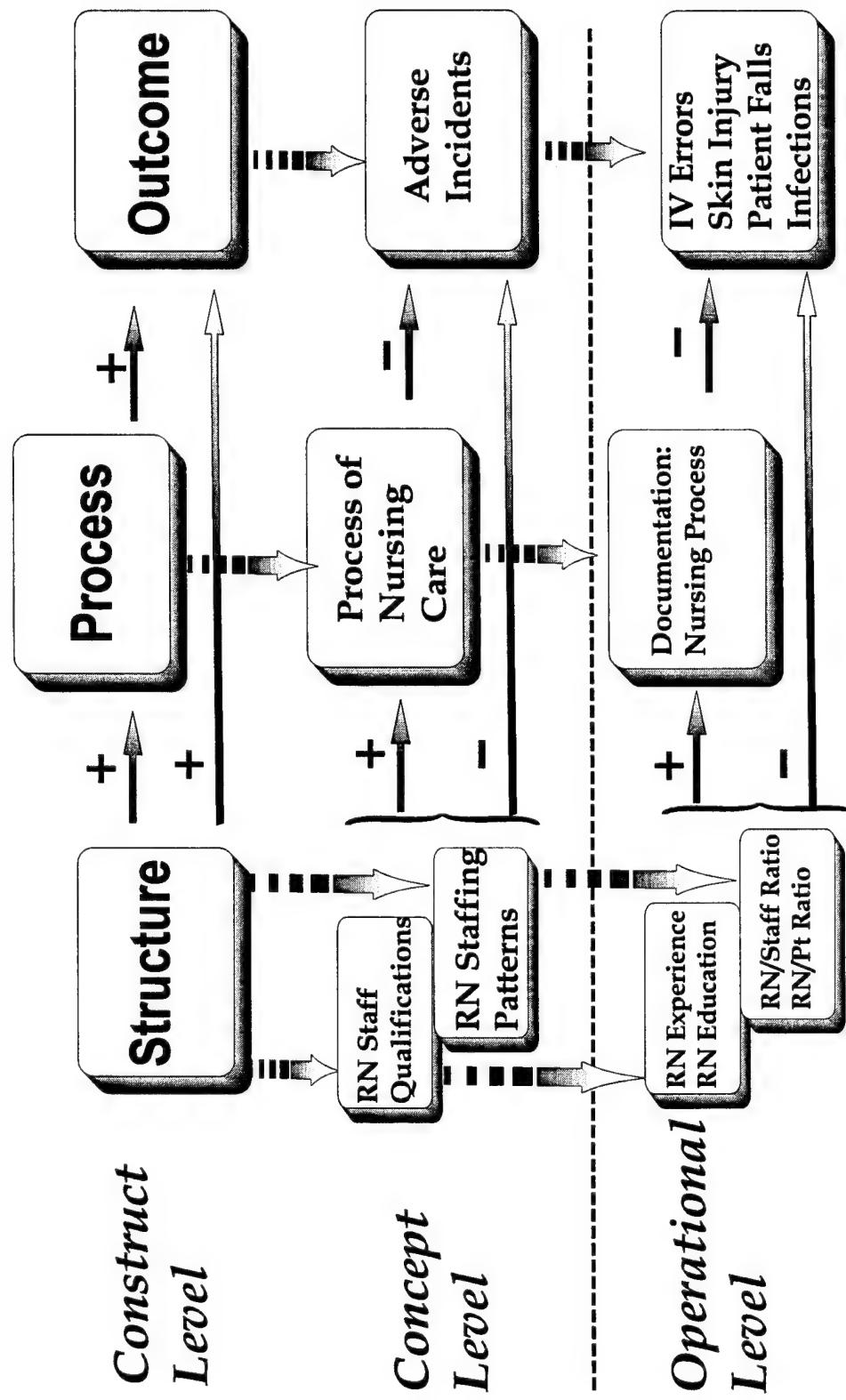
Figure 1. Conceptual Framework-Hypothesized Causal Relationships Between Nursing Structure of Care, Process of Care, and Client Outcomes in the Acute Care Setting

provides evidence of quality of performance in health care (Donabedian, 1992). Many researchers and clinical nurses alike agree with this paradigm as a framework for exploring quality care. A recent qualitative study conducted in England revealed the three categories of structure, process, and outcome to be indicators of quality care as perceived by practicing clinical nurses (Hogston, 1995).

Donabedian describes structure as the physical and organizational properties of the health care setting. The process encompasses what is done for the patient and the outcome is what is accomplished for the patient. Although the paradigm seems to demonstrate a simple progression, Donabedian asserts that the model is a simplified representation of a highly complex reality with many other intervening variables.

In the concept stage of this study the components of Structure, Process and Outcome were more specifically defined. Structure was identified as RN Staffing Patterns, Process was specified as the Process of Nursing Care, and Outcome was categorized as Adverse Incidents. The third stage was operational and specified the actual variables used to measure the concepts. The predictions of relationships between components of the model was indicated by positive (+)and negative (-) signs and was based on previous research, theory, and anecdotal beliefs in the profession.

Donabedian (1992) considers causality among variables as an important attribute for use of the model as an evaluative tool. He asserts that a causal relationship must exist between adjacent groups of variables, that the relationships exist as probabilities and not certainties, and the probabilities may vary widely in magnitude. Likewise, the following are considered by Donabedian to be additional significant attributes of outcomes as

indicators of quality. These attributes are important to consider when using this model for nursing research and are especially helpful when analyzing and discussing research findings (1992).

1. Outcomes do not directly assess quality, but only permit an inference about the quality of the structure and process of care.

2. The amount of confidence for each inference depends on the strength of the predetermined causal relationship.

3. The causal relationship is often modified by factors other than the care provided, such as acuity of patients, and corrections must be made for these factors.

4. Because the relationships are only probabilities, one must collect an appropriately large number of cases before making inferences.

5. Outcomes are integrative and reflect the contributions of all those who provide care, including self-care by the patient.

6. It is difficult to isolate with certainty the specific errors or virtues that have contributed to specific outcomes.

7. When evaluating quality care it is important to consider the availability of information, its completeness, its accuracy, its susceptibility to manipulation, and the cost of its acquisition.

8. Health care professionals are more willing to establish standards for processes than for outcomes.

Lastly, Donabedian (1992) explains why the combination of data relating to structure, process and outcome is helpful in assessing quality care. It provides a

multidimensional assessment of quality and helps to identify the site and causes of failures in quality. In addition, researchers consistent inferences drawn from the variety of indicators increase confidence in the validity of the indicator. Inconsistent inferences drawn from several types of indicators may lead researchers to search for problems in the data base, methods of measurement or suggest that the predetermined causal relationships are faulty.

## Summary

There was a growing interest among nursing scientists in the field of outcomes research. The DGPP project was identified as a rich source of data for an exploratory study on patient outcomes research. A review of literature revealed that despite the conclusion that nursing care substantially influences patient health outcomes, studies on nursing care and patient outcomes were inadequate (Cummings, 1992). Significant gaps in knowledge remained in regard to the variables selected for this research.

The framework used to conceptualize the relationship between variables in this study was adapted from Donabedian's (1966) model on structure, process, and outcome. A framework was developed to provide a basis for understanding the causal relationships between RN Staffing Patterns, RN Staff Qualifications, the Process of Nursing Care, and Client Outcomes in the acute care setting.

CHAPTER 3

METHODOLOGY

This first section of this chapter explains the basic research design for this study. Since this was a secondary analysis of data, the methodology for the original DGPP study, including setting, data collection, and sample, are described next. The third section describes the methodology for this secondary data analysis, including sample, data collection, and operalization of concepts. Sections on human subjects and a plan for data analysis complete this chapter.

Research Design

This exploratory, descriptive study was a secondary analysis of data from the DGPP study conducted in Arizona hospitals. The DGPP project was initiated as a response to the nursing shortage in the late 1980's. The project, supported by a federal grant (U01 NR02153), was conducted from 1989 to 1992 to test the effectiveness of a unit-based professional nursing practice model. Implementation of the DGPP model was intended to change nursing practice in hospitals by infusing components of group governance, differentiated care delivery and shared values in a culture of excellence. The innovative model was designed to ultimately increase nursing autonomy, promote commitment to the organization, professional nursing practice, and enhance quality patient care. The following information is a summary of the DGPP final report (Verran, Gerber, & Milton, 1996).

DGPP Methodology

Setting

In the DGPP study, data were collected from patient care units in 8 Arizona hospitals that volunteered to participate (Table 1). Four of the hospitals were located in rural settings and four in urban areas. The hospitals were equally divided into demonstration sites and comparison sites with ten patient care units participating in each category. The hospitals and units were matched by services offered, size and type of hospital, and surrounding community size and economic status. One of the rural demonstration sites chose to end their participation in the study after two years leaving nine demonstration nursing units. The participating nursing units were medical-surgical or intensive care units and varied in patient population and acuity.

Data Collection

Data were collected for four years on the demonstration units and for two years on the comparison units. Data were collected on both the individual staff RN level and the unit work group level. The data were collected by trained Program Coordinators in the demonstration sites and Research Facilitators in the comparison sites.

Data collection at individual staff RN level. DGPP Project surveys were used to collect individual data from RNs at five times during the project (Appendix A). The five data collection times for the DGPP project were January 1989, October 1989, October 1990, October 1991, and October 1992. Only data from the first two surveys were used in the current study. Response rates from surveys averaged fifty percent or greater across all five data collection times.

Table 1

Demonstration and Comparison Units Studied for the DGPP Project

| Demonstration Hospitals | Demonstration Units | Comparison Hospitals | Comparison Units |
|---|---|---|---|
| A. Rural | 1. Medical-Surgical | E. Rural | 11. Medical-Surgical |
| | 2. Medical-Surgical | | 12. Medical-Surgical |
| | 3. Intensive Care/ Step Down | | 13. Coronary Care |
| B. Urban | 4. Intensive Care | F. Urban | 14. Coronary Care |
| | 5. Telemetry | | 15. Telemetry |
| | 6. Oncology | | 16. Oncology |
| C. Urban | 7. Medical-Surgical | G. Urban | 17. Medical-Surgical |
| | 8. Intensive Care | | 18. Intensive Care |
| | 9. Telemetry | | 19. Medical-Surgical |
| D. Rural | 10. Total Hospital (dropped from study) | H. Rural | 20. Total Hospital |

Data collection at unit work group level. Unit level data were collected monthly from each of the participating nursing units, in both the comparison and demonstration sites, for the first two years of the study using Fiscal and Quality Data Forms (Appendix B). Only the first two years of data were used in this secondary data analysis. One deviation to unit data collection times was for documentation variables that were collected monthly beginning in June of 1989. During the second two years of the project, data were collected monthly for only the first and fourth quarters and from only the demonstration sites (Table 2). Pre-existing hospital and unit records were used to collect unit level data on fiscal and quality data. Data on nursing documentation was collected by random chart audits of discharged patients. Using a scaled chart audit form, seven patient records per month were surveyed (Appendix C).

Sample

The sample for unit level data consisted of the twenty nursing units participating in the first two years and the nine nursing units participating in the last two years of the study. The sample for individual data included RNs employed by the hospital for at least three months and who worked at least two days per week. The sample excluded nurses who worked at irregular intervals or on a per diem basis. Staff also had to have worked at least four days in the last month to be included in the sample. Depending on the number of surveys returned, the sample size ranged from 370 at time 1 to 143 at time 5.

Table 2

Unit Level Data Collection Times

| | 1989 | | | | 1990 | | | | 1991 | | | | 1992 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| **Comparison Sites** | X | X | X | X | X | X | X | X | | | | | | | | |
| **Demonstration Sites** | X | X | X | X | X | X | X | X | X | | | X | X | | | X |

Note.  Q1=January through March, Q2=April through June, Q3=July through September, Q4=October through December

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Methodology for Secondary Data Analysis

Sample/Data Collection

The unit of analysis for this research was the nursing unit. The data included both

unit work group level data and individual staff RN data aggregated to the unit level. The

data base was created by extracting selected data from the DGPP data base from 1989 and

1990, the first two years of the project. These times were selected as they occurred prior

to implementation of the demonstration model, at a time when the nursing units are

assumed to have comparable attributes.

Unit level data. For unit level data, quarterly data were used for the 2 years for

each of the 20 nursing units. Each quarter was considered a sampling unit, thus with 20

nursing units times 8 quarters a final sample size of 160 resulted. One nursing unit was

dropped due to missing data over time on key variables, leaving 19 nursing units. The

study of these units over time results in data redundancy, however this compromise should

not have greatly affected this study since it was principally exploratory in nature.

Unit level data included RN staffing patterns, nursing process of care, and adverse

patient outcomes. The data for RN staffing patterns and patient outcomes were extracted

from information originating on the Fiscal and Quality Data Forms. The data for nursing

process of care was extracted from information originating on the chart audit forms. Data

for these variables were originally collected for each unit monthly. These calculations

were statistically averaged for quarterly values.

Individual level data. Data at the individual level included components of RN

qualifications. This information was extracted from RN surveys and aggregated to the

nursing unit. Data for this study were extracted from RN surveys collected in January 1989, October 1989, and October 1990. Since quarterly data were desired, the data from January 1989 was replicated for the second and third quarter of 1989, the data from October 1989 was replicated for the first and second quarter of 1990, and the data from October 1990 was replicated for the third quarter 1990.

<u>Complexity of Nursing Care</u>

After examination of the variables in question for this study, it was realized that the complexity of nursing care required on each unit needed to be considered when analyzing the data. Factoring in adjustments for patient acuity was cited as an important factor in outcomes research. When measuring outcomes, nursing acuity systems were found to have predictive power (Rosenthal et al., 1992). Since the acuity levels, or complexity of nursing required, on each unit was not collected in the original DGPP study, a nursing complexity scale was devised.

Using the expert opinions of the DGPP investigative team, the nineteen nursing units were assigned a complexity value based on a four-point nursing complexity scale. It was determined that a score of four equated with the highest complexity and a score of one equated with the lowest complexity of nursing skill required. A score of four was assigned to intensive care units in tertiary facilities, a score of three was assigned to intensive care units in other hospitals and general care units in tertiary facilities, a score of two was assigned to general units in urban facilities, and a score of one was assigned to general medical-surgical units in rural locations.

Operalization of Concepts

      The ANA's (1995) list of Acute Care Nursing Quality Indicators was used as a guideline for selecting variables to measure for this secondary data analysis. Since data collection for the DGPP was not designed for the purposes of this study, attempts were made to determine what operational data could be used as reliable measures of quality. The measurement of variables in the DGPP data base was reviewed for matches to the ANA indicators. From these matches, variables relating to Structure of Care, Process of Care, and Client Outcomes were selected for this study (Table 3). Some differences in the operalization of concepts were evident as a result of the variations in classifications of variables and available data.

      Structure of Care. The first concept under Structure of Care is RN Staff Qualifications. This concept included both RN Experience and RN Education. RN experience was operationalized as the number of years and months licensed as an RN. The "years since basic education" in nursing was also considered as an indicator of experience. Since these indicators were so closely related statistically, only one was chosen. The ANA (1995) defined RN experience as the ratio of the total number of RN years of experience to the total number of RNs on staff. It was not specified how years of experience was calculated.

      RN Education was operationalized as the percentage of RN staff with Baccalaureate and higher degrees. The ANA (1995) defined this indicator as the distribution of educational preparation among RN staff, typically expressed as the percentage of nursing staff with a certain educational attainment level.

Table 3

Comparison of ANA Quality Indicators and Variables for This Study

| Quality Indicators as listed by ANA | Variables used in this study |
|---|---|
| **Structure of Care:** | **Structure of Care:** |
| Ratio of Total Nursing Staff to Patients<br>    - RN/Patient Ratio | RN Staffing Patterns<br>    - RN to Patient Ratio |
| Ratio of RNs to Total Nursing Staff<br>    - Mix of RNs, LPNs, and<br>    Unlicensed workers | RN Staffing Patterns<br>    -RN to Total Nursing Staff<br>    Ratio |
| RN Staff Qualifications<br>    - RN Staff Experience | RN Staff Qualifications<br>    - RN Staff Experience |
| RN Staff Qualifications<br>    - RN Staff Education | RN Staff Qualifications<br>    - RN Staff Education |
| **Process of Care:** | **Process of Care:** |
| Assessment and Implementation of Patient<br>Care Requirements<br>    - Documentation of Nursing<br>    Diagnoses, Therapeutic Objectives<br>    and Care Given | Plan of Nursing Care<br>    - Documentation of the<br>    Nursing process |
| **Patient-Focused Outcomes:** | **Client Outcomes:** |
| Adverse Incidents<br>    - Medication Error Rate | Adverse Incidents<br>    - Errors in Medication/IV<br>    Administration |
| Adverse Incidents<br>    - Patient Injury Rate | Adverse Incidents<br>    - Patient Fall Rate |
| Adverse Incidents<br>    - Patient Injury Rate | Adverse Incidents<br>    - Hospital Incurred Skin Injury |
| Complications<br>    - Nosocomial Infection Rate | Adverse Incidents<br>    - Nosocomial Infection Rate |

The second concept under Structure is RN Staffing Patterns. This concept included both RN to Total Nursing Staff Ratio and RN to Patient Ratio. The RN to Total Nursing Staff Ratio was operationalized as the number of RN hours per total hours of nursing care provided by RNs, LPNs, and unlicensed workers. Using the data available, a computation was necessary to obtain the correct information. RN hours was divided by patient days; this number was then divided by the total nursing staff hours per patient day. The ANA (1995) defined this indicator as the number of RNs (expressed in full time equivalents) per number of the total nursing staff (RNs, LPNs, unlicensed workers).

The RN to Patient Ratio was operationalized as the number of RNs employed per patient day. The ANA similarly defined this variable as the total number of RNs (expressed in full time equivalents) per patient.

Process of Care. The concept under Process was the Process of Nursing Care. This concept was further specified as Nursing Process Documentation. This was operationalized through the use of the DGPP nursing documentation chart audit form. Nineteen items relating to documentation or evidence of use of the nursing process were numerically scored on a four point Likert-type scale. The ANA (1995) defined this indicator as the extent to which acute care nurses are performing components of the nursing process. How this might be measured was not indicated.

Client Outcomes. The last category of quality indicators was Outcome, and the concept Adverse Incidents was derived from this. Included under Adverse Incidents are IV Fluid Errors, Patient Falls, Skin Injuries, and Nosocomial Infections. IV Errors were operationalized as the number of IV medication or fluid errors that occurred, divided by

patient days and multiplied times one hundred for a rate. The ANA (1995) defined this as a component of medication error rate. It was further defined as the rate at which errors in the administration of IV fluids occurred within a given nursing unit.

Patient Falls were operationalized as the number of patient falls or slips that occur, divided by patient days and multiplied times one hundred for a rate. The ANA (1995) defined Patient Falls as a component of patient injury rate. It was further defined as the rate at which patients fall during the course of their hospital stay.

Skin Injuries were operationalized as the number of patient burns or skin breakdowns that occurred as a result of hospital care, divided by patient days and multiplied times one hundred for a rate. The ANA (1995) defines this indicator as a component of patient injury rate. It was further defined as the rate at which patients incurred physical injuries to the skin (unrelated to a surgical or diagnostic procedure) during the course of their hospital stay.

The last indicator was Nosocomial Infections. Nosocomial Infections were operationalized as the total number of nosocomial infections that occurred, divided by patient days and multiplied times one hundred for a rate. The ANA (1995) defined nosocomial infections as the rate at which patients experienced infections (all sites) originating in the hospital.

Human Subjects

The original DGPP study was granted an exempt status from University review by the College of Nursing Ethical Review Subcommittee of the Research Committee in

accordance with regulations forwarded by the University Committee on Human Subjects.

The only requirement was use of a disclaimer for subjects to read prior to verbal consent.

Use of this data for a secondary data analysis was approved by the Principal Investigator

of the original study and subsequently by the Director of Clinical Research at the

University of Arizona, College of Nursing (Appendix D).

Participants were assigned confidential code numbers to maintain anonymity.

These codes were used on all repeated data collection forms. The master list of

participants and code numbers was kept in a locked cabinet in the project office and made

available only to the assigned research assistants. At no time during the project did

Program Coordinators or the site Principal Investigators handle the raw data or completed

questionnaires.

Data Analysis Plan

Descriptive statistics were used to describe the sample. Pearson's $r$ correlation

statistics were used to describe relationships between variables. Multiple regression

analyses were used to determine the relative significance groups of independent variables

against one dependent variable and to make a determination regarding a mediating

variable. The probability level for statistical significance of correlations was set at $p \leq$

0.05. Because of the small number of nursing units and exploratory nature of this study,

multiple regressions analyses were run with a significance level of $p \leq 0.10$. The Statistical

Packages for the Social Sciences (SPSS) Unix® 4.0 software package was used for all

statistical analyses.

Summary

This secondary analysis study was a descriptive, exploratory study using data from a four year research project in Arizona to study the effectiveness of a unit based professional practice model in nursing. Selected data were imported from the original DGPP data base and modified to create a new data base for this study. Converting the first two years of DGPP data from nineteen patient care units into quarterly data provided the sampling units. Human subjects approval for this secondary data analysis was waived based on prior approval for the original study. Pearson's correlations and multiple regressions were the statistical methods of analyses used to provide an understanding of the relationships among variables.

CHAPTER 4

RESULTS OF DATA ANALYSIS

Results of this secondary analysis are divided into three sections. The first section is a discussion of the demographic characteristics of the nursing units in the study derived from the aggregated individual data on RN Staff. The second section addresses the correlational relationships between nursing Structure of Care, and Client Outcome variables and therefore answers the first 16 research questions presented. The third section is a presentation of the results of multiple regression analysis performed to determine the relative significance of groups of independent variables using the Complexity of Nursing Care as a control. This section answers the final research question by addressing whether the Process of Care mediates the effects that nursing Structure of Care has on Client Outcomes. This chapter is concluded with a summary of these findings.

Demographic Characteristics of RN Sample Aggregated to the Unit Level

As previously discussed in Chapter 3, the data on individual RN staff were collected from nurses at three times. Data from these three times were replicated to make eight to match the eight quarters of unit level data. This individual data were aggregated to the unit level for each of the 19 nursing units. The demographic data discussed represents unit level data only. No individual data is being presented.

Two quarters (sampling units) of data were missing from one hospital unit and one quarter (sampling unit) of data were missing from three other hospital units. With a total of five quarters of data missing, the final sample size is 147 sampling units. Of the 147 sampling units, valid RN cases ranged from 54 to 139.

The average age of nurses on patient care units ranged from 28.7 to 44.2 ($M$=37.8, $sd$=3.8). The gender from each sampling unit ranged from an average of 69.2 % to 100 % female ($M$=92.2, $sd$=7.2). The average percentages of nurses on patient care units who were married ranged from 38.9% to 100% ($M$=65.2, $sd$=14.6). The average number of years nurses on patient care units were licensed as a registered nurse ranged from 3.4 to 20.1 years ($M$=10.1, $sd$=3.9). The average percentages of nurses in each sampling unit with an educational attainment of a Bachelor's degree or higher ranged from 0% to 68.0% ($M$=29.8, $sd$=17.3). The ranges, means, and standard deviations for each of these sample characteristics are depicted in Table 4. The means and standard deviations for the Structure, Process, and Outcome variables for this study are depicted in Table 5. The means shown in Tables 4 and 5 represent the averages of these variables for the eight periods, across the 147 sampling units.

## Analysis of Correlations

Research questions one through sixteen were answered using Pearson's $r$ correlations. The first eight research questions addressed the relationships between nursing Structure variables of RN Staffing Patterns, and Client Outcome variables. Research questions nine through sixteen addressed the relationships between nursing

Table 4

Ranges, Means, and Standard Deviations for RN Sample Characteristics Aggregated to
the Unit Level

| | Range | $M$ | $sd$ |
|---|---|---|---|
| Age in years | 28.7-44.2 | 37.8 | 3.8 |
| % Female | 69.2-100 | 92.2 | 7.2 |
| % Married | 38.9-100 | 65.2 | 14.6 |
| Years licensed as an RN | 3.4-20.1 | 10.1 | 3.9 |
| % With Bachelor's or higher degree | 0-68.0 | 29.8 | 17.3 |

Note: $M$ = mean, $sd$ = standard deviation

Table 5

Means and Standard Deviations for Nursing Structure of Care, Process of Care, and Client Outcome Variables

| Structure, Process, & Outcome Variables | M | sd |
|---|---|---|
| **Nursing Structure Variables** | | |
| RN to Patient Ratio | .06 | .04 |
| RN to Total Nursing Staff Ratio | .72 | .20 |
| RN Education | 29.75 | 17.30 |
| RN Experience | 10.10 | 3.87 |
| **Process of Care Variable** | | |
| Nursing Process Documentation | 1.45 | .34 |
| **Client Outcome Variables** | | |
| IV Error Rate | 1.84 | 2.27 |
| Patient Fall Rate | 2.45 | 2.08 |
| Skin Injury Rate | .79 | 1.30 |
| Nosocomial Infection Rate | 9.30 | 8.78 |

Note: $M$ = mean, $sd$ = standard deviation

Structure variables of RN Qualifications and Client Outcome variables. Table 6 indicates the relationships and correlation coefficients relating to these first sixteen research questions.

Based on research and the belief that the structure of nursing care does effect quality outcomes, negative correlations were expected between nursing Structure of Care variables and dependent adverse Client Outcome variables. Significant negative correlations in support of the conceptual model were found between variables in four research questions indicating the following relationships: the greater the RN to Patient Ratio, the lower the incidence of Patient Falls; the greater the RN Staff Experience, the lower the incidence of Nosocomial Infections; the greater the RN Staff Education level, the lower the incidence of IV Fluid Errors; and the greater the RN Staff Experience, the lower the incidence of Skin Injuries.

A number of positive relationships between variables were also found which was opposite what was anticipated and does not support the conceptual model. Significant positive correlations were found between variables in five research questions indicating the following relationships: the greater the RN to Patient Ratio, the greater the incidence of Skin Injuries; the greater the RN to Patient Ratio, the greater the incidence of Nosocomial Infections; the greater the RN to Total Nursing Staff Ratio, the greater the incidence of IV Fluid Errors; the greater the RN Staff Education, the greater the incidence of Skin Injuries; and the greater the RN Staff Education, the greater the incidence of Nosocomial Infections.

Table 6

Correlation Coefficients and Results of Significance for First Sixteen Research Questions

| Research Questions | r and significance | Support of Conceptual Model |
|---|---|---|
| 1. RN to Pt Ratio & IV Errors | .10 (NS) | |
| 2. RN to Pt Ratio & Skin Injuries | .34 (p ≤ .05) | No |
| 3. RN to Pt Ratio & Patient Falls | −.25 (p ≤ .05) | Yes |
| 4. RN to Pt Ratio & Nosocomial Infections | .59 (p ≤ .05) | No |
| 5. RN to Total Nursing Staff Ratio & IV Errors | .38 (p ≤ .05) | No |
| 6. RN to Total Nursing Staff Ratio & Skin Injuries | −.09 (NS) | |
| 7. RN to Total Nursing Staff Ratio & Patient Falls | .04 (NS) | |
| 8. RN to Total Nursing Staff Ratio & Nosocomial Infections | .02 (NS) | |
| 9. RN Experience & IV Errors | .13 (NS) | |
| 10. RN Experience & Skin Injuries | −.21 (p ≤ .05) | Yes |
| 11. RN Experience & Patient Falls | .15 (NS) | |
| 12. RN Experience & Nosocomial Infections | −.28 (p ≤ .05) | Yes |
| 13. RN Education & IV Errors | −.17 (p ≤ .05) | Yes |
| 14. RN Education & Skin Injuries | .41 (p ≤ .05) | No |
| 15. RN Education & Patient Falls | −.09 (NS) | |
| 16. RN Education & Nosocomial Infections | .33 (p ≤ .05) | No |

The remaining seven research questions examined showed insignificant correlations between variables and therefore did not support the conceptual model. Non-significant relationships were found between RN to Patient Ratio and IV Fluid Error Rate, RN to Total Nursing Staff Ratio and Skin Injury Rate, RN to Total Nursing Staff Ratio and Patient Fall Rate, RN to Total Nursing Staff Ratio and Nosocomial Infection Rate, RN Staff Experience and IV Fluid Error Rate, RN Staff Experience and Patient Fall Rate, and RN Staff Education and Patient Fall Rate.

## Analysis of Multiple Regressions

In order to determine the relationships between Complexity of Nursing Care, Structure of Care, Process of Care, and Client Outcome variables, bivariate correlations were analyzed first. Significant relationships were found between the Complexity of Nursing Care and all other variables as seen in Table 7. The Complexity of Nursing Care was positively correlated with the RN to Patient Ratio ($r = .58$), RN Education ($r = .59$), Skin Injuries ($r = .40$), and Nosocomial Infections ($r = .59$). Significant negative relationships were found between RN Experience ($r = -.29$), Nursing Process Documentation ($r = -.73$), IV Errors ($r = -.23$), and Patient Falls ($r = -.40$). In addition, there was a significant negative relationship between the Complexity of Nursing Care and the RN to Total Nursing Staff Ratio ($r = -.38$). This finding was opposite the RN to Patient Ratio and Complexity of Nursing Care relationship and is theoretically incongruous. The variables were checked for errors in recording and computation and

Table 7

Pearson's *r* Correlation Coefficients for Complexity of Nursing Care and
Indicators of Nursing Structure of Care, Process of Care, and Client Outcomes

| Structure, Process, & Outcome Variables | Complexity of Nursing Care |
|---|---|
| **Nursing Structure Variables** | |
| RN to Patient Ratio | .58* |
| RN to Total Nursing Staff Ratio | −.38* |
| RN Education | .59* |
| RN Experience | −.29* |
| **Process of Care Variable** | |
| Nursing Process Documentation | −.72* |
| **Client Outcome Variables** | |
| IV Errors | −.23* |
| Patient Falls | −.40* |
| Skin Injuries | .40* |
| Nosocomial Infections | .59* |

Note: * = $p \leq .05$

found to be accurate. One can only surmise that a reporting error or inconsistency occurred in the original data.

Multiple regression analysis was done to further examine relationships between variables by determining the relative significance of groups of independent predictor variables against one dependent variable. The Complexity of Nursing Care was used as a statistical control due to its theoretical and statistical significance with all other variables in this study. The statistics generated were used to answer the final research question of whether the Process of Care mediates the effects that the Structure of Care has on Client Outcomes. All regression analyses were performed using a significance level of $p \leq .10$. This significance level was chosen due to the exploratory nature of this study.

Two types of models were developed from the regression analysis. The first set of models discussed represented the results of four equations showing the relationships of all previously staged Structure and Process variables with the four Client Outcome variables as dependent variables, using Complexity of Nursing Care as a control. The first set of models also includes the results of a fifth equation representing the relationships between the Structure of Care variables and Nursing Process Documentation as a dependent variable. Following these initial regression equations, full models are presented to show the multiple relationships of Complexity of Nursing Care, nursing Structure of Care, Nursing Process Documentation, and Client Outcomes. For simplicity in the full models, no beta weights are repeated, only the direction of relationships.

The first set of models included five separate equations. Performing stepwise regression for the first four equations, the Complexity of Nursing Care was added in the

first block, the four nursing Structure of Care variables, RN to Patient Ratio, RN to Total

Nursing Staff Ratio, RN Experience, and RN Education, were added in the second block,

and Nursing Process Documentation was added in the third block. Equations were run for

each of the four dependent variables, IV Errors, Skin Injuries, Patient Falls, and

Nosocomial Infections. The equations are diagrammed in figures 2, 3, 4, and 5.

This blocking of variables was selected for the following reasons. Complexity of

Nursing Care was added in block one, as it was felt to be a control and its effect needed to

be removed first. Because Nursing Process Documentation was believed to be an

intervening variable between Structure of Care and Client Outcomes, it was entered last,

after the Structure variables.

In the first equation, the concept Complexity of Nursing Care demonstrated a

negative influence on IV Errors, whereas RN to Total Nursing Staff Ratio and RN to

Patient Ratio demonstrated a positive influence on IV Errors. These three concepts

together explained 19 % of the variance (Figure 2). The variables RN Experience, RN

Education, and Nursing Process Documentation did not enter the equation.

In the second equation, the concepts Complexity of Nursing Care and RN

Education demonstrated a positive influence on Skin Injuries. These concepts together

explained 25% of the variance (Figure 3). The concepts, RN to Patient Ratio, RN to

Total Staff Ratio, RN Experience, and Nursing Process Documentation did not enter the

equation.

In the third equation, the concepts Complexity of Nursing Care and RN to Total

Nursing Staff Ratio demonstrated a negative influence on Patient Falls, and RN Education

demonstrated a positive influence on Patient Falls. These concepts together explained 15 % of the variance (Figure 4). The concepts RN to Patient Ratio, RN Experience, and Nursing Process Documentation did not enter the equation.

In the fourth equation, the concepts Complexity of Nursing Care and RN to Patient Ratio demonstrated a positive influence on Nosocomial Infections, whereas RN Experience demonstrated a negative influence on Nosocomial Infections. These three concepts together explained 43 % of the variance (Figure 5). The concepts RN to Total Nursing Staff Ratio, RN Education, and Nursing Process Documentation did not enter the equation.

The fifth multiple regression equation was run with the concept Nursing Process Documentation as the dependent variable. The concept Complexity of Nursing Care was again added in the first block and the four nursing Structure of Care variables, RN to Patient Ratio, RN to Total Nursing Staff Ratio, RN Experience, and RN Education, were added in the second block. Three concepts entered the equation and accounted for 67 % of the variance. Complexity of Nursing Care demonstrated a negative influence on Nursing Process Documentation. Two concepts demonstrated a positive influence on Nursing Process Documentation: RN to Patient Ratio and RN to Total Nursing Staff Ratio (Figure 6). RN Education and RN Experience did not enter the equation.

The next set of figures (7 through 10)represent full models showing the multiple relationships between Complexity of Nursing Care, Structure of Nursing Care, Nursing Process Documentation, and Client Outcomes.
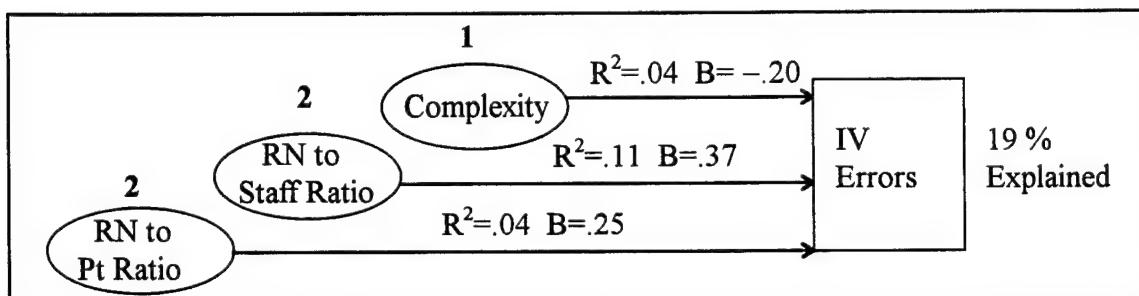
Figure 2. Influence of Nursing Structure and Process Variables on IV Errors
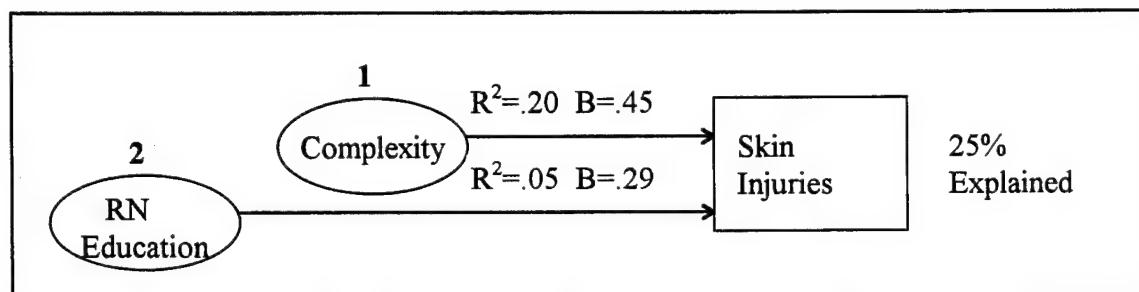


Figure 3. Influence of Nursing Structure and Process Variables on Skin Injuries
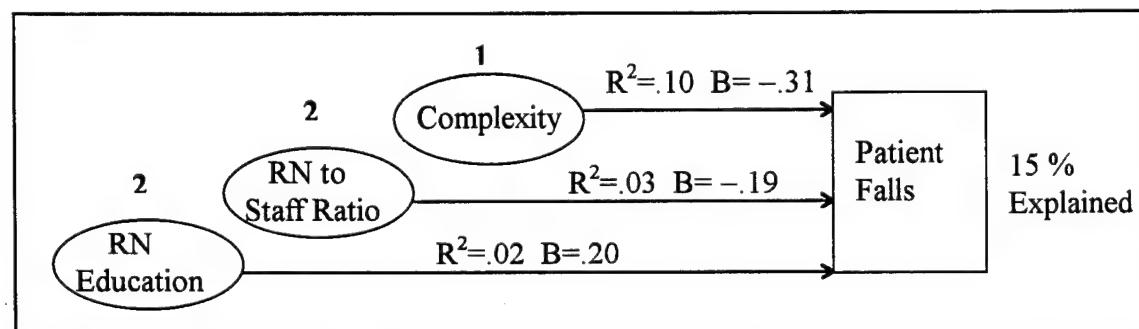


Figure 4. Influence of Nursing Structure and Process Variables on Patient Falls
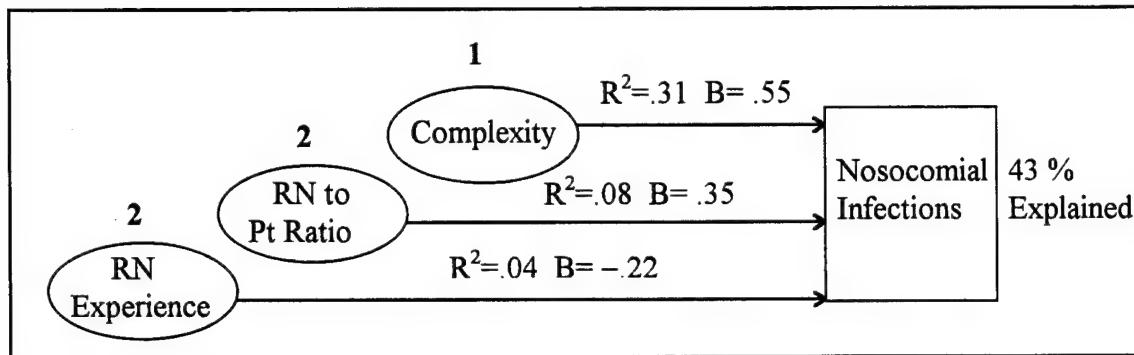
Figure 5. Influence of Nursing Structure and Process Variables on Nosocomial Infections
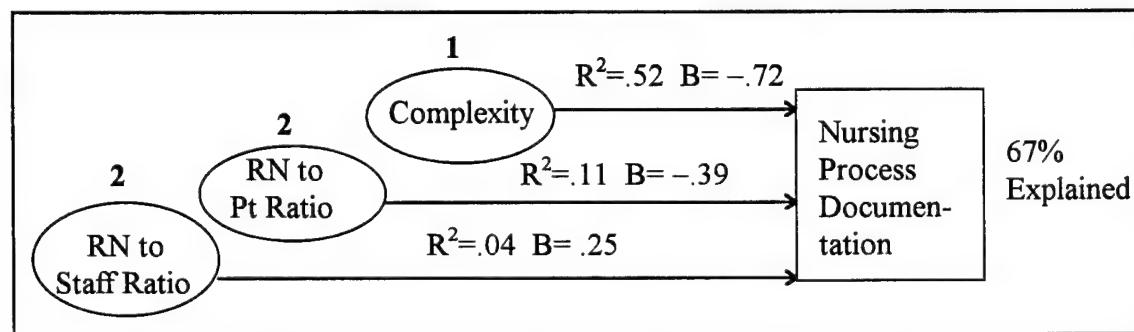


Figure 6. Influence of Nursing Structure Variables on Nursing Process Documentation

Control Variable    Structure Variables    Process Variable    Outcome Variable

$R^2=.67$

Nursing Process
Documentation

(−)

Complexity of
Nursing Care

(−)

(−)

(+)

$R^2=.19$

IV
Errors

(+)

(−)

RN/Staff
Ratio

(−)

(+)

(+)

RN/Pt
Ratio

(+)
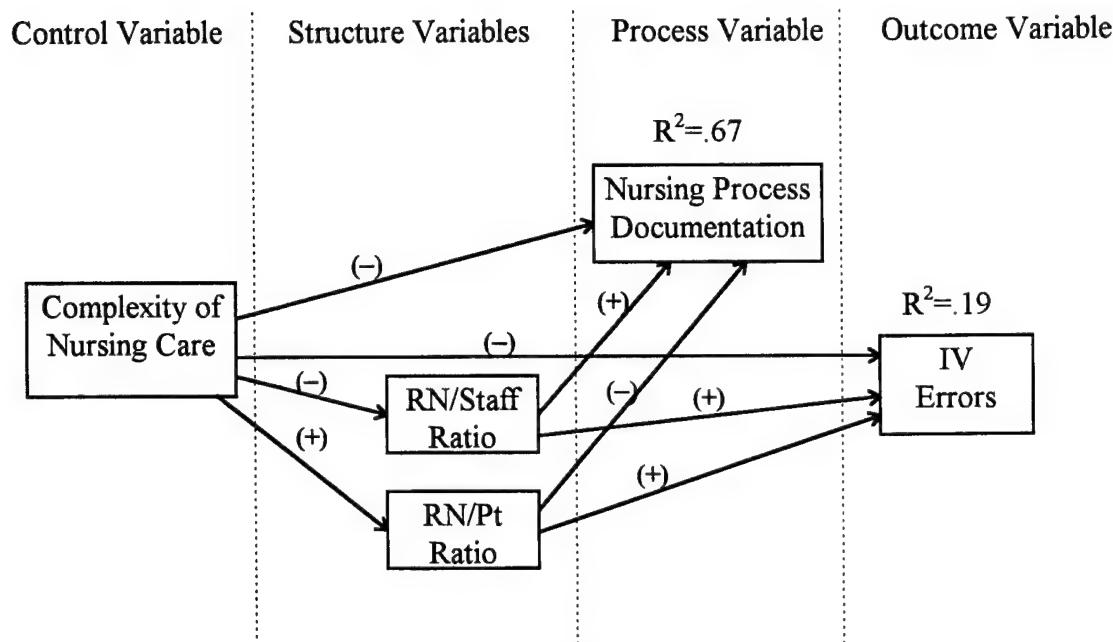
Figure 7. Full Model with Multiple Relationships of Complexity of Nursing Care, Nursing Structure of Care, Nursing Process Documentation, and IV Errors as Client Outcome.

Control Variable    Structure Variables    Process Variable    Outcome Variable

RN/Pt
Ratio

(−)

$R^2=.67$

RN/Staff
Ratio

(+)

Nursing Process
Documentation

Complexity of
Nursing Care

(−)

(+)

$R^2=.25$

Skin
Injuries

(+)

RN
Education

(+)
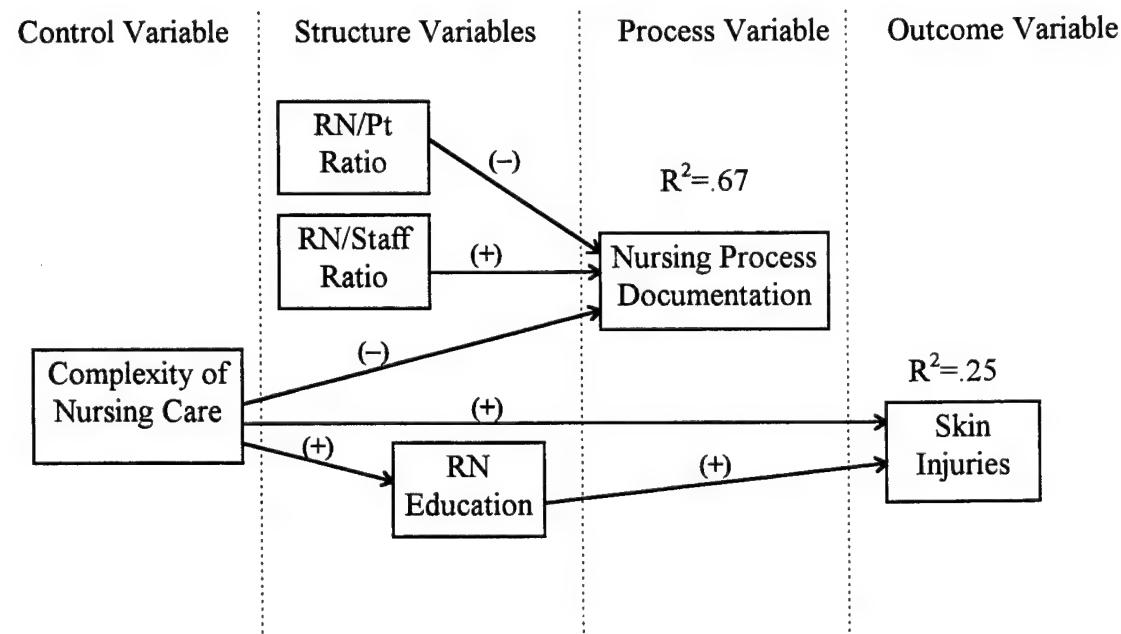
Figure 8. Full Model with Multiple Relationships of Complexity of Nursing Care, Nursing Structure of Care, Nursing Process Documentation, and Skin Injuries as Client Outcome.
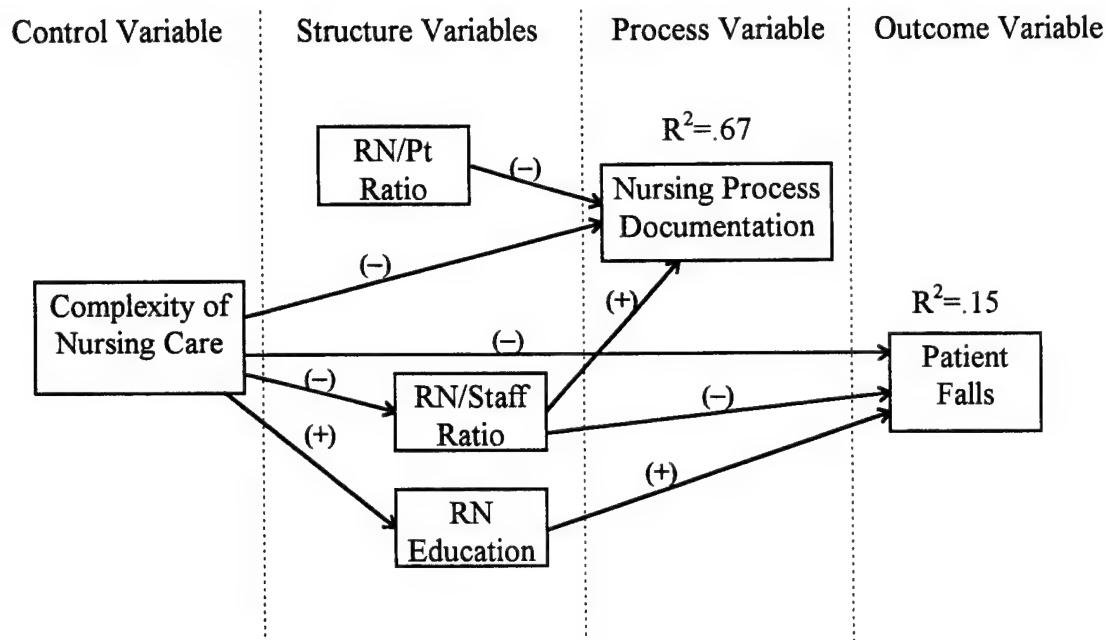
Figure 9. Full Model with Multiple Relationships of Complexity of Nursing Care, Nursing Structure of Care, Nursing Process Documentation, and Patient Falls as Client Outcome.
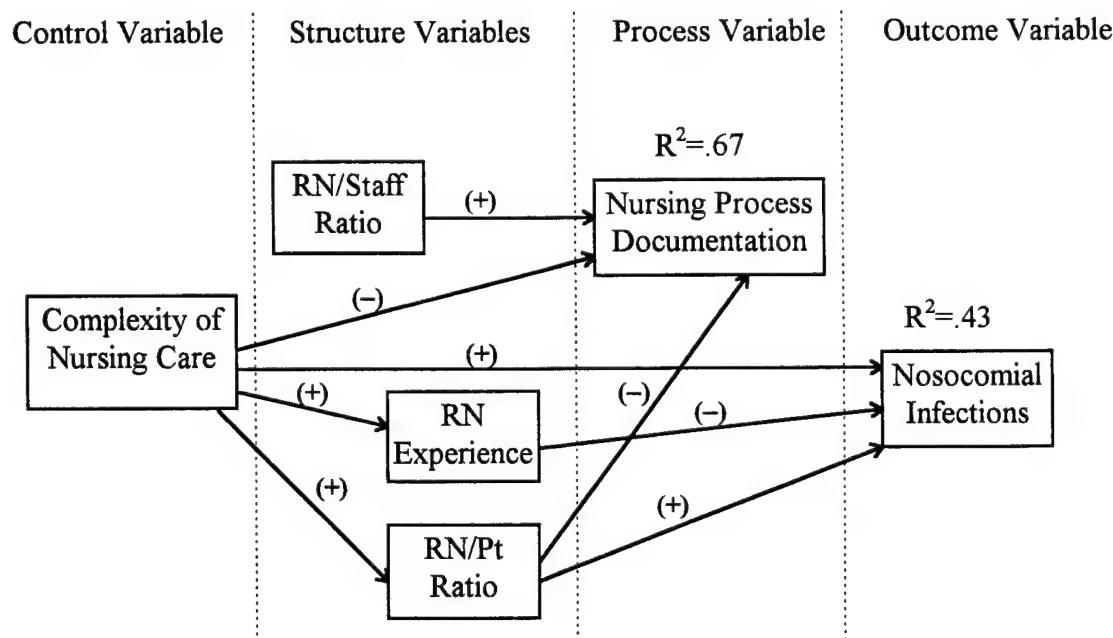


Figure 10. Full Model with Multiple Relationships of Complexity of Nursing Care, Nursing Structure of Care, Nursing Process Documentation, and Nosocomial Infections as Client Outcome

Summary

Descriptive statistics of mean, standard deviation and range were used to

describe the sample of RNs from patient care units that were aggregated to the unit level.

The average age of nurses on patient care units ranged from 29 to 44 and the sample was

predominately female ($M$=92%). The average percent of subjects who were married

ranged from 39% to 100%. Nurses on patient care units were licensed as registered

nurses an average of 10 years with a range of 3 to 20 years. The average percentage of

nurses on patient care units earning a Bachelor's degree or higher ranged from 0% to 68%

with an average of 30%.

The Pearson's $r$ correlation was used to describe the relationship between

nursing Structure of Care variables and Client Outcome variables. The statistics generated

were used to answer research questions one through sixteen. Significant correlations in

support of the conceptual model were found for RN to Patient Ratio and Pt Falls, RN

Education and IV Errors, and RN Experience with both Skin Injuries and Nosocomial

Infections. Although the influence of Structure variables on Outcome Variables is

inconsistent, one significant relationship was found with Structure for each of the four

Client Outcomes. The only structure variable not represented in support of the conceptual

model was RN to Total Staff Ratio, the variable suspected of errors or inconsistencies

when the data were reported.

Significant correlations with relationships opposite of anticipated were found for

RN to Patient Ratio and Skin Injuries, RN to Patient Ratio and Nosocomial Infections,

RN to Total Nursing Staff Ratio and IV Errors, RN Education and Skin Injuries, and RN Education and Nosocomial Infections. Significant correlations were also found between Complexity of Nursing Care and all other variables in this study.

Stepwise multiple regression analysis was used to determine the influence of nursing Structure of Care variables and the Process of Care variable on Client Outcome variables using the Complexity of Nursing Care as a control. These analyses were used to answer the final research question of whether the Process of Care mediates the effects that the Structure of Care has on Client Outcomes. In the full models with IV Errors, Skin Injuries, Patient Falls, and Nosocomial Infections as dependent variables, Nursing Process Documentation did not serve as a mediator, yet there was direct and indirect effects of Complexity of Nursing Care on Client Outcomes through various Structure of Care variables. Although the results showed that the Process of Care did not mediate the effects that Structure has on Outcomes, 67% of the variance of the Process of Care may be attributed to Complexity of Nursing Care and two variables representing RN Staffing Patterns.

CHAPTER 5

INTERPRETATION, CONCLUSIONS, LIMITATIONS, AND

RECOMMENDATIONS

This descriptive, exploratory study was a secondary data analysis using selected

data from the DGPP Project and had three purposes. The first purpose was to examine

the relationships between nursing Structure variables of RN Staffing Patterns and Client

Outcomes in the acute care setting. The second purpose was to examine the relationships

between nursing Structure variables of RN Qualifications and Client Outcomes in the

acute care setting. The third purpose was to determine whether the Process of Care

significantly mediates the effects that nursing Structure has on Client Outcomes using the

Complexity of Nursing Care as a control. The findings were interpreted and discussed

relative to each research purpose and the conceptual model. Limitations of the study are

also presented as well as implications for nursing management and recommendations for

continued outcomes research.

Interpretation of Findings Related to Research Purpose #1

The first purpose was to examine the relationships between nursing Structure

variables of RN Staffing Patterns and Client Outcomes in the acute care setting. Research

questions one through eight address this first purpose. Pearson's $r$ correlations were

performed to determine if significant relationships existed between variables. In the first

four research questions, the relationship of RN to Patient Ratio with IV Errors, Skin

Injuries, Patient Falls, and Nosocomial Infections is queried. The RN to Patient Ratio was found to be significantly positively related to both Skin Injuries and Nosocomial Infections. No relationship was found between IV Errors and RN to Patient Ratio. These findings do not support the conceptual model. A significant negative relationship was found between RN to Patient Ratio and Patient Falls in support of the conceptual model.

In research questions five through eight, the relationship between RN to Total Nursing Staff Ratio and each of the four Client Outcome variables, IV Errors, Skin Injuries, Patient Falls, and Nosocomial Infections was questioned. These findings were almost opposite those for the previous variable of RN Staffing Patterns. The RN to Total Nursing Staff Ratio was found not to be significantly related to Skin Injuries, Patient Falls, or Nosocomial Infections, yet showed a moderate positive relationship with IV Errors. None of these findings support the conceptual model.

The findings for the first eight research questions were mostly inconsistent with the conceptual model proposing that RN Staffing Patterns have a negative relationship with adverse Client Outcomes. The only relationship that supported the model was the negative one between RN to Patient Ratio and Patient Falls. The unanticipated positive relationship between RN to Patient Ratio and Skin Injuries may be a spurious correlation related to patient acuity level since the Complexity of Nursing Care had a strong positive correlation with the RN to Patient Ratio. In the multiple regression equation with Skin Injuries as the dependent variable, the effects of RN to Patient Ratio were no longer significant when Complexity of Nursing Care is added as a control variable. Conversely, the Complexity of Nursing Care could not be considered as an explanation for the positive

relationship between RN to Patient Ratio and Nosocomial Infections, since RN to Patient Ratio continued to show a positive influence on Nosocomial Infections even after the effects of Complexity have been removed. One possible explanation may be the fact that in instances with higher RN to patient ratios there are generally more staff available to care for patients. The presence of more people in a given area increase the opportunities for infections to occur. Another explanation may be related to the generally low rates of nosocomial infections. An occurrence of infections after consistent rates of zero could statistically skew the results and change the direction of the correlations. The current literature relating to these variables was inadequate, further complicating interpretation of these findings.

Since RN to Patient Ratio and RN to Total Nursing Staff Ratio are considered related components of RN Staffing Patterns (ANA, 1995), one would expect similar relationships with the same dependent variables. It is interesting that the results were almost opposite. The previously indicated problems with RN to Total Nursing Staff Ratio may be one of the reason for the conflicting findings related to this variable.

Interpretation of Findings Related to Research Purpose #2

The second purpose was to examine the relationships between nursing Structure variables of RN Qualifications and Client Outcomes in the acute care setting. Research questions nine through sixteen addressed this second purpose. Pearson's *r* correlations were performed to determine if significant relationships existed between variables.

In research questions nine through twelve, the relationship of RN Staff Experience to IV Errors, Skin Injuries, Patient Falls, and Nosocomial Infections was queried. RN Staff Experience showed no significant relationship with IV Errors or Patient Falls. In support of the conceptual model, significant negative relationships were found between RN Staff Experience and both Skin Injuries and Nosocomial Infections. This finding was consistent with Goodnough-Hanneman's (1990) dissertation study results that advances in nursing expertise and experience result in positive patient outcomes, including prevention and reversal of patient complications. In the multiple regression equations, RN Staff Experience no longer has an influence on Skin Injuries when Complexity of Nursing Care is entered as a control. Ideas stated by Gibbs, McCaughan, and Griffiths (1991) provide an interesting possible explanation for the non-significant findings. These researchers proposed that the relationship of nursing abilities and experience may be curvilinear, with nursing abilities increasing initially with experience then declining once a certain level is reached.

In research questions thirteen through sixteen, the relationship of RN Staff Education to IV Errors, Skin Injuries, Patient Falls, and Nosocomial Infections was questioned. In these correlations, RN Staff Education was found to be positively correlated with Skin Injuries and Nosocomial Infections. This was a reverse finding of RN Staff Experience with these Outcomes and does not support the conceptual model. When Complexity of Nursing Care is controlled in the multiple regression equations, RN Staff Education is still significantly positively related to Skin Injuries, yet becomes non-significant with Nosocomial Infections. The relationship between RN Staff Education and

IV Errors was negative and supported the conceptual model, yet became non-significant when Complexity of Nursing Care is added as a control.

The three negative relationships found for these eight research questions supported the conceptual model by indicating that RN Staff Qualifications were negatively related to adverse Client Outcomes. The unanticipated positive relationship between RN Education and Nosocomial Infections may be a spurious correlation related to patient acuity level since the Complexity of Nursing Care had a strong positive correlation with the RN Education. In the multiple regression equation with Nosocomial Infections as the dependent variable, the effects of RN Education were no longer significant when Complexity of Nursing Care is added as a control variable. The positive relationship between RN Staff Education and Skin Injuries, despite controlling for Complexity of Nursing Care was difficult to explain. Furthermore, there was little empirical data relating to RN Staff Qualifications and Client Outcomes with which to compare results.

Interpretation of Findings Related to Research Purpose #3

The third purpose was to determine whether the Process of Care significantly mediates the effects that nursing Structure has on Client Outcomes using the Complexity of Nursing Care as a control. Research question number seventeen addressed this final purpose. Multiple regression analysis was performed to answer this question.

The results showed a direct relationship between Structure and Outcomes in all equations. However, the Process of Care was not a mediator for these variables, as there

was no indirect relationship between Structure of Nursing Care and Client Outcome through Process of Care. These findings did not support the conceptual model.

At this time, there was but discursive support for the nursing process and its benefit to Client Outcomes. The difficulty in accurately measuring the nursing process may be one reason for this. Although objective documentation of the nursing process may be fairly simple, other non-documented instances of the process taking place were not currently included in data collection. Can we really say that documentation was a true indicator or reflection of the care provided? Many report deficiencies in documentation in comparison to what is actually being done for the patient (Turner, 1991, Hanson et al., 1990).

## Conclusions

Results for the first sixteen research questions reveal a combination of positive, negative, and non-significant relationships, and did not occur in any easily explainable pattern. Seven of the research relationships queried were non-significant. Results contradictory to the proposed conceptual model occurred in five research questions. Research questions were answered in support of the conceptual model in only four instances. All Structure variables, except RN to Total Nursing Staff Ratio, are represented at least once as having a direct influence on Outcomes as anticipated. A reporting error or inconsistency in the original data for RN to Total Nursing Staff Ratio is thought to have occurred. Each of the four Client Outcomes was found to be significantly influenced by at least one Structure variable in the anticipated direction. From this

perspective the model is very loosely supported. There is little empirical data with which to compare or help to explain results. The final research question result showed that the Process of Care is not a mediator of the effects that Structure has on Outcome, yet there were questions regarding the measurement of this indicator.

Clear explanations for all of the unanticipated results were difficult to provide and perhaps were related to the limitations of the study. In addition, the complexities of the variables in question are many. Mark (1995) strongly cautions outcomes researchers not to make rash assumptions from their data. She states that, "...without a lucid explanation of the causal relationships among structure, process, and outcomes, patient outcomes research exist in a vacuum." (p. 42). Although distinct assumptions regarding the relationships between nursing Structure, Process, and Outcomes can not be made, this exploratory study provided useful information for determining the feasibility of replicating this study on a broader scale.

## Limitations of the Study

The initial limitation to consider was that this is a secondary data analysis using data collected for purposes other than the intentions of this study. One problem with using the DGPP data was that the outcome data from the DGPP was not acuity adjusted. Because patient acuity level was considered an important factor in measuring outcomes (Rosenthal et al., 1992), a nursing acuity variable needed to be constructed. The method for definition and assignment of Complexity of Nursing Care was created for this study specifically to satisfy this deficit and was therefore untested and unrefined.

Another problem related to the use of data for a secondary analysis is in the measurement of concepts. Accurately defining and then isolating indicators of nursing quality commonly has its challenges. With many patient outcomes studies, it is difficult to separate the effects of nursing care from the effects of care provided by other disciplines. Although defining nursing quality indicators was accomplished by the ANA (1995), the definitions are often vague and left to much individual interpretation. Extracting data from the DGPP data set and redefining the variables as Structure, Process, and Outcome, may not have precisely reflected nursing indicators for the conceptual framework of this study as hoped. Moritz (1995) states that the examination of methodological challenges in measuring the effectiveness of nursing care continues to be a problem.

Limitations of this study were also related to the sample. Although the sample size was fairly large, a much larger study would be needed to clarify inconsistencies. In addition, the fact that patient care units were the unit of analysis presents its own unique set of problems. In order to use the patient care unit as the unit of analysis, individual data on nursing staff needed to be aggregated to the group level. When data are aggregated, there are often decreases in variability that may bias the results of statistical analysis (Ferketich, & Verran, 1991). Replication of the individual data to match the unit level data also has the potential of decreasing variability.

Another limitation of this study was possible errors or inconsistencies in reporting data. First there was the threat of errors in recording raw data. This was addressed in relation to the variable RN to Total Nursing Staff Ratio. Correspondingly, one hospital was dropped from this study due to data that consistently noted the "total staff hours" as

less than the "total RN hours." Secondly, possible reporting inconsistencies may have been related to the use of existing hospital records as a source for staffing pattern data. RN hours, patient days, and total staff hours per patient day were used from the Quality Fiscal Data Forms to establish the RN staffing variables for this study. Even though these were considered common hospital statistics, one needs to question the variation in guidelines used to calculate these numbers. For example, one hospital may have considered all workers on a unit's payroll, including Housekeepers and Unit Clerks, as Nursing Staff, while others may not.

## Recommendations for Nursing Management

The importance of nursing outcomes research has been established and nurses are being encouraged to proceed with meaningful studies. One of the widely recognized challenges is the scarcity and shortcomings of available data sets for conducting these studies (Cherkin, 1991; Jones, 1993). The collection of data specifically for the purposes of a study will help to enhance research control, yet would be prove to be costly if large samples are obtained. If we are to use existing data bases, will the components be sufficient to meet the needs of the study?

The ANA (1995) discusses the benefits and current inadequacies of national, state and institutional specific data bases. Lack of standardization of quality indicators within data bases is an obstacle. For example, the ANA cautions the use of national data bases without considering the comparability of nursing acuity systems. Mark and Burleson

(1995) also discuss the problems with incompatibility of outcomes definitions and measurements.

It is undoubtedly essential to ensure that adequate nursing-specific quality indicators are included in national data bases. Weis (1992) identified the Health Care Financing Administration Medicare claim files as a data source well suited for nursing outcomes research, yet Jones (1993) finds this source severely limited of nursing related variables. At a patient outcomes research conference Hinshaw (1991) discussed the reality that nurse-specific elements are frequently missing from large health care data bases. Holzemer (1990) expresses dismay over the fact that many governmental reports on health care and quality measures are prepared with no mention of the contributions of nursing or other disciplines other than physicians. Many health care researchers have indicated that the focus of outcomes research needs to be more multidisciplanary. Nurses can facilitate the expansion of nationally recognized outcome indicators by being active in the formulation of healthcare data bases and collaborate in the development of the new computerized patient record systems.

Health care delivery systems are under scrutiny and subject to sudden change by eager administrators. Porter-O'Grady (1996) states that nurse leaders must be comfortable with the many conflicts that arise from change. Nurse executives should become earnestly involved in the many processes of the health care business and provide facts to substantiate their beliefs and recommendations. In order to justify certain RN staffing patterns, nurse executives need to demonstrate favorable cost-benefit ratios. In addition, we need to contribute our knowledge of nursing quality outcomes for the benefit

of the public's health care decision making (Holzemer, 1990) and to promote public

confidence in the nursing profession (Higgins, McCaughan, Griffiths, & Carr-Hill, 1992).

It is equally important to promote our profession by adding to the scientific knowledge

base of nursing (Jones, 1993) and to have the resources needed to influence health policy

decisions (Jennings, 1991; Sprayberry, 1993). More published patient outcomes research

is essential to provide nurses with the knowledge needed.

Recommendations for Nursing Research

There is still a great deal of research to be accomplished in the area of patient

outcomes and nursing practice. From an extensive review of the literature, Thomas and

Bond (1991) agree that we need to emphasize the features of nursing structure and

process that influence patient outcomes. The results of this secondary analysis provide

valuable information for continuation of this type of research. Replication of this study on

a larger scale is recommended. The admitted challenges in obtaining the necessary data

may be one reason for the current research gaps. Multi-site collaboration with other nurse

researchers in the country would help to enlarge the study, ease the burden of data

collection, and improve the generalizability of the findings. As previously indicated, the

successful use of national data bases would also decrease the burden of time and finances.

Problems with measurement of variables need to addressed and resolved for future

studies of this nature. A study of 16 hospitals by Mark and Burleson (1995) revealed a

lack of standardized documentation of patient outcomes and many variations in measuring

outcomes. A hospital's criteria for calculating common statistics such as staff hours and

patient days need to be determined. Inconsistencies in measurement severely threaten the validity of the research. In addition, the prospective inclusion of a measurement of the complexity of nursing care required is needed to enhance the reliability of this type of study.

There is still some question as to what variables are reliable measurements of nursing care provided. Not only do variables need to be collectable and interpretable, they also need to be accurate reflections of nursing quality. Griffiths states that we need to specifically determine the patient outcomes nursing intends to influence (1995). Do the patient outcomes we currently measure provide the best indication of the quality of nursing care provided?

Documentation of the Nursing Process as a valid indicator of nursing care was questioned. The tool used to measure this variable is divided into the four common subcomponents of the nursing process: nursing assessment, planning, implementation, and evaluation. Perhaps examining the relationships between outcomes and each of these components separately would provide more information.

An examination of nursing structure variables is also needed. The ANA (1995) points out the importance of determining a research based definition of "adequate" staffing before further research in comparing this variable to quality of care. Although Jennings (1991) recognized the problems of measurement and definition in outcomes research, she stated that despite the challenges "...it is imperative that nurses seize the opportunity to take a proactive position in examining patient outcomes..." (p. 61).

Summary

The purposes of this descriptive, exploratory study were to: (a) examine the relationships between nursing Structure variables of RN Staffing Patterns and Client Outcomes of Adverse Incidents in the acute care setting, (b) examine the relationships between nursing Structure variables of RN Qualifications and Client Outcomes of Adverse Incidents in the acute care setting, and (c) to determine whether the Process of Care significantly mediates the effects that nursing Structure has on Client Outcomes.

The results related to the first two research purposes revealed a combination of positive, negative, and non-significant relationships between nursing Structure and Client Outcome variables. The results only loosely support the conceptual model. The results related to the third research purpose revealed that the Process of Care does not significantly mediate the effects that nursing Structure has on Client Outcomes. This finding does not support the conceptual model. There is very little research based literature with which to compare findings.

Despite the inconclusive findings, this secondary data analysis provides useful information for future studies. The replication of this study on a larger scale with multi-site collaboration is recommended. Challenges with access to data and problems associated with the accurate definition and measurement of variables is discussed. Furthermore, recommendations for nursing management are presented.

In order to meet the increasingly complex demands of health care reform, nurses must recognize the need to carefully balance quality with productivity and flexibility (Hicks, Stallmeyer, & Coleman, 1992). The domain of outcomes research is ripe with

ideas and suggestions for the advancement of nursing knowledge. More research is

urgently needed to help resolve the current health care conflicts related to nursing

structure and client outcomes in the acute care setting.

APPENDIX A

DGPP SURVEY FOR INDIVIDUAL DATA COLLECTION

ID# _____

## PARTICIPANT PROFILE INFORMATION

1. Current Licensure: _____ RN _____ LPN

2. Length of time licensed: _____ years _____ months

3. Age: _____ years

4. Gender: _____ male _____ female

5. Marital status (check one):
   _____ single
   _____ married
   _____ separated
   _____ divorced
   _____ widowed

6. Number of children living at home: _____

   Ages of children living at home: _____

   Number of other dependents (elderly, ill, etc.) living with you: _____

7. Employment status: _____ employed in this hospital part-time
   _____ employed in this hospital full-time

8. Length of time employed in this hospital: _____ years _____ months

9. Length of time employed on this unit: _____ years _____ months

10. Shift most frequently worked (check one):
    _____ day
    _____ evening
    _____ night
    _____ rotate

11. Length of shift normally worked:
    _____ 8 hours
    _____ 10 hours
    _____ 12 hours
    _____ other

ID# _____

12. Basic educational preparation in nursing (check one):

      _____ Diploma
      _____ Associate Degree
      _____ Baccalaureate

13. Year you completed basic education in nursing: _____

14. Highest degree you completed (check one):

      _____ Associate Degree (Nursing)
      _____ Associate Degree (Not in Nursing)
      _____ Baccalaureate Degree (Nursing)
      _____ Baccalaureate Degree (Not in Nursing)
      _____ Master's Degree (Nursing)
      _____ Master's Degree (Not in Nursing)
      _____ Other (please specify) _____

15. Year you completed highest education in nursing:     _____

16. Number of years you have lived in this community:     _____

17. Number of years you plan to live in this community:     _____

APPENDIX B

FISCAL AND QUALITY DATA FORMS

int. & date _____
int. & date _____

DIFFERENTIATED GROUP PROFESSIONAL PRACTICE IN NURSING
MONTHLY COST CENTER FISCAL DATA

HOSPITAL _____          MONTH _____          YEAR _____

All figures should reflect values at end of month, or for full month, unless otherwise noted.
Full Time = 32 hours or more.

| VARIABLE | | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC |
|---|---|---|---|---|---|---|---|
| 1. Budgeted RN FTEs | (#) | | | | | | |
| 2. Unfilled RN positions | (#) | | | | | | |
| 3. unfilled RN positions | (FTE) | | | | | | |
| 4. RNs employed | (#) | | | | | | |
| 5. RNs hired | (#) | | | | | | |
| 6. RNs terminating | (#) | | | | | | |
| 7. RNs transferring in | (#) | | | | | | |
| 8. RNs transferring out | (#) | | | | | | |
| 9. RNs working full time | (#) | | | | | | |
| 10. | (#) | | | | | | |
| 11. | (#) | | | | | | |
| 12. Patient days | (#) | | | | | | |

fiscal/1
bft 7/90

| VARIABLE | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: |
|---|---|---|---|---|---|---|
| 13. Actual RN hours worked (#) | | | | | | |
| 14. Total Hours/Patient Day (#) | | | | | | |
| 15. Operating costs ($) | | | | | | |
| 16. Total personnel costs ($) | | | | | | |
| 17. RN paid time worked ($) | | | | | | |
| 18. RN paid time not worked ($) | | | | | | |
| 19. Supplemental agency cost ($) | | | | | | |
| 20. Supplemental RN cost ($) | | | | | | |
| 21. RN overtime hours (#) | | | | | | |
| 22. RN absenteeism hours (#) | | | | | | |
| 23. Length of Stay by unit | | | | | | |
| 24. Number of Patient Satisfaction Cards Distributed by unit | | | | | | |

Hospital Information:

25. Average RN hourly salary (estimate amount) ($) _____

26. RNs terminating from hospital (#) _____

27. RNs hired into hospital (#) _____

fiscal/2
bft 7/90

int. & date _____
int. & date _____

DIFFERENTIATED GROUP PROFESSIONAL PRACTICE IN NURSING
MONTHLY COST CENTER INCIDENT/QUALITY DATA

HOSPITAL _____  MONTH _____  YEAR _____

All figures should reflect values at end of month, or for full month, unless otherwise noted.

| VARIABLE | | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC: | UNIT / CC |
|---|---|---|---|---|---|---|---|---|
| 1. AMAs | (#) | | | | | | | |
| 2. Burns/Skin Breakdown | (#) | | | | | | | |
| 3. Falls/Slips | (#) | | | | | | | |
| 4. Medication/IV: Omissions | (#) | | | | | | | |
| 5. Medication/IV: Dose/Drug | (#) | | | | | | | |
| 6. Medication/IV: Delay | (#) | | | | | | | |
| 7. Medication/IV: Other | (#) | | | | | | | |
| 8. IV Fluid: Omission | (#) | | | | | | | |
| 9. IV Fluid: Dose/Drug | (#) | | | | | | | |
| 10. IV Fluid: Delay | (#) | | | | | | | |
| 11. IV Fluid: Other | (#) | | | | | | | |
| 12. Nosocomial Inf: UTI | (#) | | | | | | | |
| 13. Nosocomial Inf: Resp. | (#) | | | | | | | |
| 14. Nosocomial Inf: Other | (#) | | | | | | | |

quality bft 7/90

APPENDIX C

NURSING DOCUMENTATION CHART AUDIT FORMS

Differentiated Group Professional Practice
in Nursing

UNIT _____     DATE REVIEWED _____     PATIENT I.D. _____     DISCHARGE _____

INDICATOR: DOCUMENTATION/EVIDENCE OF USE OF NURSING PROCESS.

Key: 0 = Not Present; 1 = Minimal; 2 = Satisfactory; 3 = Very Good; NA = Does not apply

NURSING ASSESSMENT:

1. Patient assessment, on all admissions, within 4 hours of admission,
   (or documentation of reason why not).                                          0    1    2    3    NA

2. Review of all systems is documented on nurse's admission sheet.               0    1    2    3    NA

3. Admission weight recorded.                                                     0    1    2    3    NA

4. There is a statement about the patient's psychosocial attitudes
   of health habits.                                                             0    1    2    3    NA

5. There is a statement about the patient's support system/home environment.     0    1    2    3    NA

6. There is a statement about the patient's health goals and/or expectations.    0    1    2    3    NA

PLANNING/PROBLEM IDENTIFICATION:

1. Nursing Care Plan initiated within 24 hours.                                   0    1    2    3    NA

2. Problems are in nursing diagnosis format. (Evaluate last 3 problems).          0    1    2    3    NA

3. Initial problems are derived from the admission nursing assessment.            0    1    2    3    NA

4. Current problems and plan of care (on day of audit)
   coincides with nurse's notes of last 24 hours.                                0    1    2    3    NA

5. Expected outcomes or goals are measurable, realistic,
   and related to problem.                                                       0    1    2    3    NA

6. Nursing orders relate to specific problem.                                    0    1    2    3    NA

7. The patient participates in the planning of care with the nurse.              0    1    2    3    NA

IMPLEMENTATION:

1. Evidence of nursing action as described in nursing care plan are
   found in the medical record. (Evaluate last 3 problems).                      0    1    2    3    NA

2. Medical plan of care is implemented as ordered.(Evaluate last 3 orders)       0    1    2    3    NA

EVALUATION:

1. Nursing Care Plan target dates are reviewed and updated as needed.            0    1    2    3    NA

2. The patient's response to care is reflected in the nursing notes.             0    1    2    3    NA

3. Additional/new patient needs are identified in the plan of care.              0    1    2    3    NA

4. The patients response to his/her prn medications is
   recorded in the nursing notes (last 24 hours).                               0    1    2    3    NA

chart/2
bft 6/90

Used with permission from Maryvale Samaritan Medical Center.

# APPENDIX D

## HUMAN SUBJECTS APPROVAL

# THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

COLLEGE OF NURSING

MEMORANDUM

TO:      Joyce A. Verrran, PhD,RN

FROM:    Linda R. Phillips, PhD, RN, FAAN
         Director of Research

DATE:    June 24, 1988

RE:      Human Subjects Review: "Differentiated Group Professional Practice in
                                 Nursing"

Your project has been reviewed and approved as exempt from University review by the
College of Nursing Ethical Review Subcommittee of the Research Committee and the
Director of Research.  A consent form with subject signature is not required for
projects exempt from full University review.  Please use only a disclaimer format
for subjects to read before giving their oral consent to the research.  The Human
Subjects Project Approval Form is filed in the office of the Director of Research if
you need access to it.

We wish you a valuable and stimulating experience with your research.

LRP/ms

Sherry Rawls-Bryce
5440 North Airway Drive
Tucson, AZ 85750


October 10, 1995


Joyce Verran, RN, PhD, RN
College of Nursing
University of Arizona
Tucson, AZ 85721


Dear Dr. Verran:

I am requesting your permission to use selected data from your research study on the
Differentiated Group Professional Practice Model (DGPP) for a secondary analysis of
data. I will be using this data for my Master's Thesis.

Thank you for your consideration of my request.


Sincerely,

Sherry Rawls-Bryce


approve/disapprove

Signature

THE UNIVERSITY OF

# ARIZONA

HEALTH SCIENCES CENTER
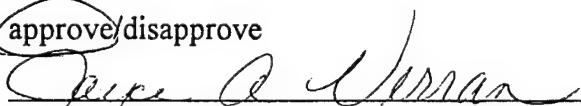
October 24, 1995

Ms. Sherry Rawls-Bryce
College of Nursing
University of Arizona
Tucson, Arizona 85721

Dear Ms. Rawls-Bryce:

Your request to complete a secondary analysis of the data collected by Joyce Verran
has been approved by the Office of Nursing Research.

We wish you success with your research.

Sincerely,

Carolyn Murdaugh, PhD, RN.FAAN
Director of Clinical Research

CM/rns

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